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REPORT

ON

The Telephone Situation in the City of Chicago

In respect to Service, Rates, Regulation of Rates, etc.

SUBMITTED TO

The Committee on Gas, Oil and Electric Light of the City Council of the City of Chicago

BY A

Special Commission

COMPOSED OF

DUGALD C. JACKSON WILLIAM H. CRUMB
GEORGE W. WILDER, Sec'y.

APRIL, 1907

Members of the Committee on Gas, Oil and Electric Light of the City Council of the City of Chicago

ALD. LISS H. YOUNG, Chairman

ALD. DANIEL V. HARKIN	ALD. PATRICK J. O'CONNELL
ALD. A. D. WILLISTON	ALD. LEWIS D. SITTS
ALD. THOS. F. SCULLY	ALD. P. H. MOYNIHAN
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ALD. PETER REINBERG	ALD. A. J. HARRIS

202219

CHICAGO, April 3, 1907.

To the Honorable Linn H. Young, Chairman, and Members of the Committee on Gas, Oil and Electric Light of the City Council of the City of Chicago.

GENTLEMEN: We have industriously worked at the problems which you laid upon us at the time of our appointment as a commission to advise you on matters relating to the telephone situation in the City of Chicago, and by instructions from time to time since, and we beg leave to hand you our report.

A telephone company in a large city must face a problem in many respects more complex than that of any other public utility corporation. The water department is called upon to sell a single commodity, namely, water, and at prices which are fixed with comparative readiness. The gas company also is called upon to sell a single commodity, metered for nearly every customer, and its conditions in dealing with customers are relatively simple. It may sell some additional by-products, as coke, tar and ammonia, but the quantities and market values of these are readily arrived at. The traction company has a more complex problem than some of the other purveyors of public utilities, but even here the price paid by the several patrons is uniform and the substantial difference between patrons lies only in the lengths of the rides which they may choose to take.

The telephone problem, on the contrary, involves many complexities, partially caused by the relatively large number of classes of service which the telephone company must offer to its patrons for the purpose of fully developing the telephone service of the city, and partially by the intangible character of the electric medium with which the telephone business is carried on, the delicacy of the apparatus used, and the wide differences in the manner and extent of the use of the apparatus by the various subscribers.

If a telephone company properly extends the telephone service in the city, it must be prepared to take care of the requirements of a range of patrons as wide as the interests of the city itself, including the largest business organizations, the hotels, the newspapers, the professional men, the small business houses, and residences of all classes. It must provide apparatus for the service of each class of patrons which will enable it to furnish the service to each subscriber at an appropriate price within his means. It is desirable for the prices to be graded so that the largest user shall not pay less than his fair share of the expense of maintaining the traffic and the remuneration to the company for its investment, and equally so that the smallest user may get his telephone service at a price which is within his means and yet is reasonably remunerative to the company for its outlay.

Telephone service has been of remarkably rapid development and extension in this country. Less than fifteen years ago there was no telephone exchange system with as many as 10,000 subscribers served by the system. At that time the number of telephones in Chicago was considerably under 10,000. Only seven years ago there were less than 25,000 telephones in Chicago, and at that time the present tremendous rate of growth in the number of telephones began, the average increase during the last five years being at the rate of approximately 20,000 telephones per year. A similar increase in the growth of the number of telephones began in New York City a couple of years earlier. The bends upward in the curves showing the numbers of telephones in Chicago and in New York are plainly evident on our Chart No. 4. The rapid expansion of the telephone service began in Chicago in 1900, and approximately two years earlier in New York.

Prior to the time when the rapid increase in the number of telephones began, the telephone art had been steadily changing, and the increased rate of expansion of the telephone service began approximately coincidently with the introduction into the great cities of the modern so-called "common battery" method of telephone operation. The prior apparatus used for telephone service was more expensive to operate and maintain, less convenient for the user, and not adapted for the extended use to which the telephone is now put in the large cities—all of which prevented the telephone service from becoming fully developed. The subscribers were not as well satisfied with the service which could be afforded them by the older apparatus and it was also necessary to charge higher prices.

During the recent period of tremendous growth which has followed the introduction of the "common battery" method of operation, accompanied by a service of greater convenience and lower prices, the telephone companies of the larger cities have been practically submerged in an effort to keep ahead of the demands of the people for additional telephones, and the problems relating to classification of service and appropriate charges for different classes of service have not been worked out in a suitable manner. The telephone companies have apparently been fully engaged in the extension of their business and the extension and improvement of their plants, and they have not found men or time to work at the details of operating economies and the best methods of handling the service of different classes of subscribers in the way that railroads, traction companies, electric light companies and various other public utility companies have been working out the details of economies relating to their processes of operation.

The telephone business is not only an unusually complex one, but the records of the existing telephone company doing a large business in Chicago are lacking in details which are needful for the fixing of specific scales of charges for different classes of service. We have endeavored to obtain data bearing on the cost of specific classes of telephone service from other telephone com-

panies, including the Bell Telephone Companies of New York and elsewhere and also from certain of the so-called Independent telephone companies, but in no instance have we been able to obtain records kept in such detail or in such manner as to afford appropriate data for fixing rates, and in every instance the rates seem to have been dictated by estimates based on experience or the requirements of business expediency, instead of being founded on a knowledge of the cost of the different classes of service. The telephone companies seem to go on the belief that their business is satisfactory if the total results of each year's business show a profit, and that it is unsatisfactory if the year's business does not show a profit, and they have heretofore apparently neglected to consider more than superficially the essential question whether the rates charged deal fairly by the different classes of subscribers.

The telephone art is by no means stable. In most of the well developed lines of industry, the art is on an advance but is advancing at a substantially stable rate. This is the condition, for instance, of the railroad art. No unforeseen or unanticipated revolutionary changes are momentarily expected to occur in the railroad art on account of discoveries or inventions, but the telephone art is different. The telephone service is now expanding at its tremendous rate largely on account of the introduction of the common battery system of operating telephones, and other improvements of more or less revolutionary character are likely to be introduced into the telephone art from time to time for decades to come.

These conditions make it impossible to arrive at any satisfactory solution of the problem of telephone rates which may be expected to extend over a period of twenty years, and we, therefore, make recommendations to you which tend toward flexibility in the operations of whatever company may receive a franchise at the hands of your Honorable Mayor and City Council, but also reserve to the city a proper degree of authority in respect to rates.

The questions laid upon us by your instructions divide themselves into four categories:

1. The feasibility of the proposed project of the Manufacturers' Telephone Company;
2. The relative merits of flat rate and measured rate telephone service;
3. The application for a franchise made by the Chicago Telephone Company;
4. The advisability of requiring universal toll connections by ordinance.

We have treated these four branches of our inquiry in the order given.

The time at our disposal was limited, but we have gone into the questions involved as deeply and as thoroughly as the time would permit.

We have called on the City Auditor, Mr. Louis E. Gosselin, and City Statistician, Mr. Hugo S. Grosser, for assistance, and we wish to thank them for their courtesy in aiding us in several directions. We also have conferred constantly with Alderman Linn H. Young, chairman of your committee. We have

made numerous requests (courteously granted in most instances) for information and data from the Engineer of the Manufacturers' Telephone Company, Mr. W. H. Johnston, and from the General Manager and Engineer of the Chicago Telephone Company, Mr. A. S. Hibbard and Mr. J. G. Wray. We have also informally consulted a number of other engineers of well recognized experience and capability in the telephone art, particularly several men connected with large Independent telephone installations.

Our conclusions are set forth in the last part of this report, and in the intervening portion we have given reasons for the conclusions, which we have illustrated by some maps and charts chosen from a large quantity of data which we gathered together. We believe that our conclusions are founded upon the best information which is available in the telephone world, and we have introduced the particular charts in our report for the purpose of illustrating the reasons for arriving at these conclusions.

I.

THE FEASIBILITY OF THE PROPOSED PROJECT OF THE MANUFACTURERS' TELEPHONE COMPANY.

The first matter taken up by us was the Manufacturers' Telephone Company's proposition, and through arrangements made by Mr. John M. Glenn, their engineer Mr. W. H. Johnston met with us at our second formal meeting. At this meeting Mr. Johnston stated that the estimates of plant cost, annual expense, annual revenue, etc., submitted to your committee under date of November 27, 1906, were the result of a general study of the situation, but that he had no detailed items, showing exchange districts, approximate central office locations, approximate conduit and pole line routes, quantities of materials, etc., in shape to present to us at once, and asked that he be given two weeks in which to get plans and figures in shape for presentation. Near the expiration of the time set, Mr. Johnston again appeared before us, presenting a map of the City of Chicago, upon which he had indicated fourteen central office districts, the approximate number of telephones expected to be installed in each district, approximate central office locations and the approximate extent and routes for his conduit system, which map he stated was indicative of the scope of his company's plans rather than an attempt at definite detailed design. This plan is manifestly different from the plan with eight central exchange offices which was described by the Manufacturers' Company to your committee.

He also presented us with revised estimates of the cost of construction, the annual cost of operation, maintenance, etc., and of the annual gross revenue which the plant might be expected to earn. Mr. Johnston stated that he considered the estimates originally presented to your committee were adequate to meet the demands for furnishing service as outlined, but that he preferred to submit to the commission a revised plan differing from

the first, but laid out to accomplish essentially the same results. The plans and estimates submitted to us do not show that the quantities of materials given as required for the outside plant construction were arrived at from the making of detailed working plans; and it is evident that these quantities were arrived at by Mr. Johnston in compiling his estimates from published information concerning the Chicago Telephone Company's plant, his personal knowledge of the conditions and requirements for telephone service in Chicago, and his general experience as a telephone engineer, and not upon a definite and detailed plan, which would include the following features determined from an extended and detailed investigation made on the ground:

Exact locations of exchange offices;
Locations of subscribers' telephones;
Exact locations of conduit routes, and quantity required;
Location, number and extent of underground and aerial cables; and
Location and extent of pole lines.

Preliminary construction estimates can be fairly accurately made following the method used by Mr. Johnston, but both of his sets of estimates must be understood to include only preliminary figures.

Revenue estimates are based upon experience and general knowledge of the requirements of the telephone users, and can not be accurately estimated in advance.

The expense items are based upon general experience with other operating telephone plants.

It is our understanding that your committee is proceeding upon the assumption that, if a franchise is granted to the Manufacturers' Telephone Company, it must be prepared at the expiration of the Chicago Telephone Company's franchise to satisfactorily handle all of the telephone traffic in the city, and we have proceeded on this basis.

The Chicago Telephone Company presented to your committee extended criticisms of the Manufacturers' Telephone Company's estimates, and brought these in greater detail before the commission. A comparison of their estimates with the two sets of estimates presented by Mr. Johnston, and the results of our own carefully made estimates relating to the project of the Manufacturers' Telephone Company, is exhibited in the accompanying tables Nos. 1, 2, 3, and 4. During the making of our estimates we have made use of data and experience from every available source to which we could get access within the time at our command. In our construction estimates we provide cable and line conductors of suitable size to give an efficiency of transmisson approximately equal to that now maintained by the Chicago Telephone Company. All of our figures have been carefully compiled and checked in detail, and we believe that they are as nearly correct as can be estimated by any one at this time with the data at hand.

The revised construction estimate submitted to us by the Manufacturers' Telephone Company contemplates the construction of a telephone plant in the City of Chicago which shall be sufficiently extensive to meet all requirements for telephone service within the city limits, and one which will have an immediate installation of fourteen central offices, equipped and ready to furnish service to 110,000 subscribers' stations. It was explained to us by their engineer that the ultimate plan of development would presumably include the construction of several smaller exchange centers in the outlying districts, which centers would probably answer the same purposes as those centers now maintained by the Chicago Telephone Company and known as neighborhood exchanges. Our construction estimate has been sufficiently liberal to permit of an increase of approximately 10,000 subscribers' telephone stations without the expenditure of a considerable amount of money for extensions, but after that number of additional stations are installed it would be necessary to make extensive additions to the plant.

The form of switchboard proposed is a combination of standard manual and automatic apparatus. Subscribers would signal to and be answered by central office operators in the same manner as with the common battery switchboards now in general operation. Each operator answering calls would be provided with means for automatically connecting a calling subscriber's line with the line called for. This method of "semi-automatic" operation is represented to be particularly adapted for large multi-office exchange systems. It has never been used in actual operation in any of the large cities or in any large exchange, but the principles have been used in smaller offices and we believe that details adapting it to large exchanges will ultimately be satisfactorily worked out. This method of operation is along the line of development which is now receiving the attention of the most competent telephone engineers in the country. It is believed that the cost of "semi-automatic" operation (when the processes have ultimately been fully developed) will be less than the cost of manual operation, for the reason that the trunking operators' services will be unnecessary, and that one operator can complete every connection required of her in practically as simple a manner as if the exchange were limited to one central office with an ordinary multiple switchboard. The subscriber's telephone would be of the regulation common battery type now used throughout the City of Chicago.

The conduit system proposed by Mr. Johnston is intended to be sufficient to ultimately meet the requirements of approximately 400,000 subscribers' stations. In compiling our conduit estimate we have given due consideration to the fact that the conduit costs in the City of Chicago are constantly increasing on account of new street improvements and the constantly increasing number of obstructions to be met with in the streets. Distribution of subscribers' lines in the conduit districts will be effected directly underground through the building basements as far as the conditions will warrant. Alley

pole lines and distributing poles will be used in residence districts. The use of open line wires will be minimized by an extensive aerial cable system.

It was proposed at certain meetings of your committee that the Manufacturers' Company might rent space in the tunnels of the Illinois Tunnel Company for the purpose of installing its underground cables, but the construction estimate submitted to us by the company's engineer involves the construction of independent conduits by his company and we have followed the same plan. It is our understanding that the telephone privileges of the Tunnel Company may pass to the control of a company with which the Manufacturers' Company, if given a franchise, would come into competition, and any arrangement for placing the cables of the Manufacturers' Company in the tunnels would be the subject of contract negotiations between the two companies and outside of our province even if the time at our command had permitted us to consider such relations.

In the estimate submitted by the Manufacturers' Company, the use of No. 22 B. and S. gauge conductor cable for all subscribers' lines is proposed. The trunk line cables are proposed to be of larger conductors in order to bring the standard of transmission up to what Mr. Johnston considers a proper point. The recent great increase in the cost of metals, especially copper, lead and iron, all of which are extensively used in telephone construction work, as well as the cost of skilled labor, will make the cost of this plant, if constructed at this time, considerably more than if built a few years ago. The fluctuations in the selling prices of copper, lead and structural steel are shown in our charts Nos. A and B, plotted from weekly quotations in the Iron Age, from which it will be seen that the price of copper has been steadily increasing during the past three years, and that the present prices of copper are higher than those prevailing at any time during the past fourteen years. The price of lead, which is used very extensively in the manufacture of telephone cables, has increased approximately fifty per cent. during the past five years, and is now higher than at any time during that period. It is estimated that if the cables and copper wire could be purchased at the prices prevailing two years ago a saving of a million dollars or more could be effected.

Mr. Johnston's revised estimate provides for a large central office building in the business district, in which the company's general offices would be located, and twelve smaller office buildings in the outlying districts. Also provisions are made for renting space in a fire-proof building in the business district in which one of the large downtown central offices would be operated. The buildings to be constructed are proposed to be of fire-proof construction.

TABLE NO. 1

ESTIMATES OF CONSTRUCTION COST.

Table No. 1 shows the results of the different estimates of construction cost. First, the Manufacturers' Company's original estimate; second, the Manufacturers' Company's revised estimate; third, the Chicago Telephone Company's estimate; and fourth, the Telephone Commission's estimate. The various items marked include the following:

1. Conduit: Main line and subsidiary conduit, including river crossings, vaults, manholes, etc., complete, ready for receiving underground cables.
2. Pole lines: Poles set in place, painted, stepped, guyed and fitted with cross-arms and fixtures.
3. Cable: Underground and aerial cable, in place, properly terminated and ready for service, also suspension wires and guying for aerial cables.
4. Line wires: All open air wires attached to poles, exclusive of drop wires.
5. Drop wires: Wires extending from poles or fixtures to subscribers' buildings.
6. Sub-station equipment: This includes 110,000 subscribers' telephones, installed ready for operation, a portion of which will be connected with private branch exchange switchboards.
7. Switchboards: Central office and private branch exchange switchboards, installed ready for operation.
8. Main building: Main office building and land in the central district, ready for occupancy.
9. Small buildings: Same as above in outlying districts.
10. Fitting of rented space in fire-proof building in central district ready for installation of central office apparatus.
11. Tools and supplies: All tools and supplies necessary for the construction, maintenance and operation of the plant.
12. Furniture and fixtures: All furniture and fixtures necessary for the construction, operation and maintenance of the plant.
13. Supervision and engineering: All necessary supervision and engineering during the designing and construction of plant.
14. Interest and insurance: Interest on investment during construction of plant and insurance on buildings, apparatus, material and supplies during construction.
15. Bank balance: Working capital necessary for operation of plant.
16. Brokerage: Difference between amount of securities issued and cash received for same. It is estimated that this will equal at least ten per cent. of amount issued.

TABLE NO. 1.

Manufacturers' Telephone Company—Construction Estimates.

		Manufacturers' Telephone Co. Original Estimate.	Manufacturers' Telephone Co. Revised Estimate.	Chicago Telephone Co. Estimate.	Telephone Commission Estimate.
1	Conduit	$3,425,000	$3,425,000	$4,290,000	$2,970,000
2	Pole lines	1,350,000	1,300,000	1,350,000	1,380,000
3	Cable, underground and aerial	3,800,000	3,274,000	4,873,500	4,785,000
4	Line wires	157,500	135,000	310,500	525,000
5	Drop wires	400,000	480,000	721,000	420,000
6	Substation equipment	1,450,000	1,450,000	1,770,000	1,620,000
7	Switchboards	2,430,000	1,580,000	3,120,000	2,326,000
8	Main building	500,000	400,000	1,000,000	500,000
9	Small buildings	300,000	432,000	600,000	480,000
10	Fitting rented space	25,000	15,000	.....	15,000
11	Tools and supplies	*a* 235,000	235,000	*a* 770,000	250,000
12	Furniture and fixtures	15,000	20,000	50,000	25,000
13	Supervision and engineering	250,000	600,000	917,750	700,000
14	Interest and insurance	570,000	*c* 550,000	*b* 90,000	600,000
15	Bank balance	100,000	*d* 400,000	500,000	300 000
	Total	$15,007,500	$14,296,000	$20,362,750	$16,896,000
16	Brokerage	.....	687,300	.....	1,877,333
	Total investment	.....	$14,983,300	.....	$18,773,333

a—Includes stable and supply buildings.
b—Insurance only.
c—Interest only.
d—Bank balance and insurance.

TABLE NO. 2.

ESTIMATES OF ANNUAL EXPENSE.

Table No. 2 shows the results of the different estimates of annual expense. The various items marked include the following:

1. Switchboard operation, etc.: Expense for making switchboard connections and supervision thereof, expense for maids, cleaners, matrons, and janitors, operators' school, operators' restaurant supplies, heat, light, power and supplies for operators' quarters and operating rooms.
2. Service inspection: Traffic records, extra cost of "peg count" and special operating supervision.
3. Contract department: Contract agent, assistants, clerks, solicitors, stationery, postage, car fares, etc.
4. Accidents and damages: Cost of adjusting claims for accidents and damages.
5. Advertising: Newspaper and general publicity advertising.
6. Collecting: Superintendent of collections, collectors, bookkeepers, clerks, stationery, postage, car fares, etc.
7. Rent: Rent of large central office in downtown district.
8. Directory: Compiling, publishing and delivering directory.
9. Switchboard repairs: Switchboard repairs, main and intermediate distributing frame jumpers, switchboard lamps, cords, etc., and maintenance supplies.
10. Line and telephone repairs: Repairing line and instrument trouble, etc., car fares, maintenance supplies, etc.
11. Cable repairs: Repairs on underground and aerial cables, electrolysis tests, labor, materials, etc.
12. Conduit repairs: Repairs on conduits, laterals, pavements, etc., labor and materials.
13. Pole line repairs: Repairs on pole lines, straightening, guying, moving poles, etc., labor and materials.
14. Line wire repairs: Repairs to open line wires, removing slack, taking down dead wires, etc., labor and materials.
15. Telephone and P. B. X.. inspections: Inspection and repairs of telephones and apparatus not at central offices, including private branch exchange (P. B. X.) switchboards, labor and materials.
16. Out orders, plant changes, etc.: Instruments removed, moved, poles moved, etc., labor and materials.
17. Care of buildings, etc.: Building repairs, repairs of tools, janitors' supplies, etc.
18. Legal: General legal expenses.
19. Taxes: City, county and state taxes.
20. Insurance: Fire and accident insurance.

TABLE NO. 2.

Manufacturers' Telephone Company—Annual Expense Estimates.

	Operation	Manufacturers' Telephone Co. Original Estimate.	Manufacturers' Telephone Co. Revised Estimate.	Chicago Telephone Co. Estimate.	Telephone Commission Estimate.
1	Switchboard operation, etc	$600,000	$739,440	$1,664,300	$739,440
	Service inspection, etc	27,000	.....	27,000	12,000
3	Contract department	125,000	74,000	80,000	74,000
4	Accidents and damages	25,000	.....	25,000	25,000
5	Advertising	20,000	20,000	60,000	20,000
6	Collecting	50,000	68,000	75,000	70,000
7	Rent	15,000	15,000	15,000	15,000
8	Directory	300,000	300,000	150,000	90,000
	Maintenance				
9	Switchboard repairs, etc	100,000	.....	.....	125,000
10	Line and telephone repairs	375,000	364,760	.....	467,500
11	Cable repairs	75,000	70,000	.....	100,000
12	Conduit repairs	10,000	10,000	.....	10,000
13	Pole line repairs	25,000	50,000	.....	60,000
14	Line wire repairs	25,000	25,000	.....	35,000
15	Telephone and P. B. X. inspections	50,000	50,000	.....	60,000
16	Out orders, plant changes, etc.	175,000	175,000	1,205,600	200,000
17	Care of buildings, etc	50,000	50,000	100,000	50,000
	General				
18	Legal	25,000	.....	50,000	25,000
19	Taxes	75,000	.....	147,000	150,000
20	Insurance	100,000	.....	50,000	50,000
21	Salaries, stationery, etc	350,000	550,000	320,000	320,000
22	Uncollected accounts	25,000	25,000	74,000	40,000
23	Reserve for repairs	100,000	390,000	100,000	300,000
24	Additional to equal M. & M. estimate	261,000	.....	.....	.....
	Total	$2,983,000	$2,976,200	$4,142,900	$3,037,940
25	Compensation to City	256,650	253,840	185,000	235,670
26	Depreciation	750,000	756,200	1,000,000	906,360
27	Interest 5 per cent	750,000	750,000	1,018,137	938,666
	Total annual expense including interest	$4,739,650	$4,736,240	$6,346,037	$5,118,636

21. Salaries, stationery, etc.: General executive and clerical force, stationery, postage, light, heat and traveling.
22. Uncollected accounts: Charge off account of uncollected rentals earned.
23. Reserve for repairs: Reserve for extraordinary repairs, emergencies and other charges not directly chargeable to routine expense.
24. Additional to equal M. and M. estimate: Total difference between Manufacturers' Company's original estimate and estimate prepared by McMeen & Miller for that company, details of which have not been placed in our hands.
25. Compensation to city: Five per cent. of gross receipts as provided in the proposed franchise submitted by the Manufacturers' Telephone Company.
26. Depreciation: Annual amount to be charged off for depreciation in value of plant.
27. Interest: Five per cent. interest on the investment.

TABLE NO. 3.

ESTIMATES OF ANNUAL REVENUE.

Table No. 3 shows the different estimates of the revenues which may be expected to be derived from the operation of the plant, if constructed as contemplated.

Our estimate of the revenue that would be earned through the operation of the plant has been carefully compiled, basing our judgment of the proportion of the subscribers who will choose the different classes of service upon the characteristics of the telephone users of Chicago as indicated by our information regarding the numbers of subscribers in the different classes of service of the Chicago Telephone Company. The essential difference between our estimate and the revised estimate of the Manufacturers' Telephone Company is that their estimate is based upon 70,000 business telephones and 40,000 residence telephones. We believe that the proportion of business to residence telephones will more nearly equal 60,000 business and 50,000 residence for the first 110,000 secured, and that after this number has been secured and the telephones placed in operation, then the residence telephones will increase more rapidly than the business telephones.

The Chicago Telephone Company's estimate of revenue to be derived from the Manufacturers' project is given in total only, their estimate having been made by applying the Manufacturers' proposed rates to their own subscribers in their several classes in such a way that the various items could not be easily reduced to the 110,000 telephones proposed to be operated by the Manufacturers' Telephone Company.

TABLE NO. 3.

Manufacturers' Telephone Company—Annual Revenue Estimates.

	Manufacturers' Telephone Co. Original Estimate.	Manufacturers' Telephone Co. Revised Estimate.	Chicago Telephone Co. Estimate.	Telephone Commission Estimate.
BUSINESS TELEPHONES				
Direct line, unlimited	$450,000	$1,215,000	.....	$1,080,000
Two-party line, unlimited	600,000	1,080,000	.....	960,000
Direct line, measured	492,000	104,400	.....	91,200
Two-party line, measured	522,000	180,000	.....	120,000
Four-party line, measured	820,000	243,000	.....	224,000
Extension sets, unlimited	60,000	37,800	.....	24,000
Extension sets, measured	65,000	10,850	.....	9,800
Private branch exchange, switchboards	14,000	28,000	.....	28,000
Trunk lines, unlimited	140,000	350,000	.....	350,000
Trunk lines, measured	91,200	80,000	.....	80,000
P. B. X. telephones	60,000	111,000	.....	96,000
RESIDENCE TELEPHONES				
Direct line, unlimited	180,000	180,000	.....	180,000
Two-party line, unlimited	225,000	270,000	.....	315,000
Four-party line, unlimited	210,000	210,000	.....	300,000
Direct line, measured	212,000	144,000	.....	136,000
Two-party line, measured	252,000	200,000	.....	184,000
Four-party line, measured	207,000	189,000	.....	288,000
Extension sets, unlimited	20,000	10,000	.....	12,000
Extension sets, measured	30,000	2,750	*3,680,600	4,400
Private lines, extension bells, etc	70,800	71,000	19,400	71,000
Tolls and pay stations	212,000	160,000	.....	160,000
Directory advertising and other revenue	200,000	200,000	.....	.....
Total annual revenue	$5,133,000	$5,076,800	$3,700,000	$4,713,400

*Total earnings all exchange telephones.

It will be noted that the estimates made by the Manufacturers' Company show a revenue item of $200,000 under the designation of "revenue from other sources," and it was explained by Mr. Johnston that this revenue would come principally from advertisements in their telephone directory. It was thought best by us, however, in our estimate to reduce the cost of publishing their directory, which you will note has been done on Table No. 2, from $300,000 to $90,000 and to omit this item from their revenues.

TABLE NO. 4

COMPARATIVE SUMMARY OF ESTIMATES.

Table No. 4 is a comparative summarization of the preceding tables showing the various estimates of the final net earning capacity of the project. Of the four sets of figures submitted, we believe the set computed by us to be the most nearly correct. The figures of the Manufacturers' Telephone Company are too optimistic, while those presented by the Chicago Telephone Company are too pessimistic. Reducing the compensation to the city to three per cent. would affect our estimate of the net earning capacity of the Manufacturers' project quite materially, but even this would not enable that company to derive sufficient funds from the proposed rates and method of charging to meet reasonable depreciation charges and pay interest on the investment, but would still leave an annual deficit of approximately $311,000.

The item of depreciation in our estimate is figured at the rate of 6 per cent. on a first cost of $15,106,000, covering plant and buildings; and we have also included a reserve fund of $300,000 per annum for repairs, which would be used for reconstruction of operating plant, made necessary by city improvements, etc. This sum of $300,000 is practically 2 per cent. of the $15,106,000, giving an aggregate for the annual contributions to a fund for depreciation, reconstruction and insurance of 8 per cent. of the cost of the operating plant. A detailed study of depreciation and reconstruction is presented in the latter part of this report, and the percentage arrived at in the computations there exhibited, agrees with the foregoing.

Our conclusion is that the project as laid out, with the rates and classes of service offered, would prove unprofitable and that eventually it would be necessary for the Manufacturers' Company to either increase or abandon its flat rates or restrict its service within a limited area to subscribers at the higher rates of service.

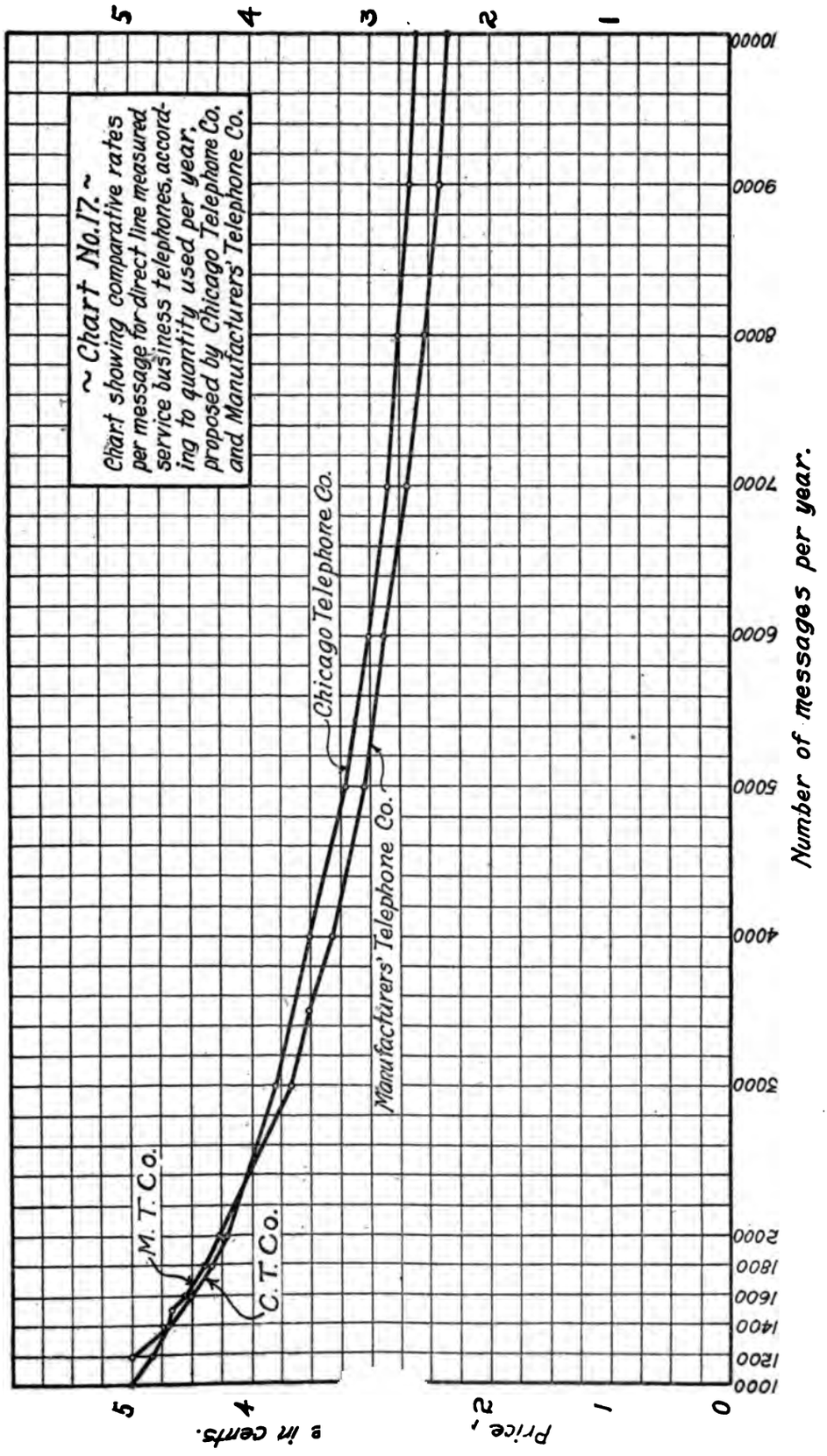
If the flat rates proposed by the Manufacturers' Company were abandoned and the company should go into operation with only the measured rates printed in the proposed franchise of the company, it is our opinion that the earnings would then be sufficient to sustain the operations of the company and pay fair dividends on the investment. This however is contrary, as we understand it, to the intention of the Manufacturers' Company and we

TABLE NO. 4.

Manufacturers' Telephone Company—Summary of Estimates.

	Manufacturers' Telephone Co. Original Summary.		Manufacturers' Telephone Co. Revised Summary.	
Investment cost of plant	.....	$15,007,500	.....	$14,983,300
Gross revenue	.....	5,133,000	.....	5,076,800
Annual expense (operating, etc.)	$2,983,000	.....	$2,976,200	.....
Compensation to City, 5% gross revenue	256,650	.....	253,840	.....
Depreciation	750,000	3,989,650	756,200	3,986,240
Net return	.....	$1,143,350	.....	$1,090,560
Interest on investment 5%	.....	750,000	.....	750,000
Surplus		$ 393,350		$ 340,560

	Chicago Telephone Co. Summary.		Telephone Commission Summary.	
Investment cost of plant	.....	$20,362,750	.....	$18,773,333
Gross revenue	.....	3,700,000	.....	4,713,400
Annual expense (operating, etc.)	$4,142,900	.....	$3,037,940	.....
Compensation to City, 5% gross revenue	185,000	.....	235,670	.....
Depreciation	1,000,000	5,327,900	906,360	4,179,970
Net return	.....	.....	.....	$ 533,430
Deficit	.....	$1,627,900	.....	.....
Interest on investment 5%	.....	$1,018,137	.....	938,666
Deficit		$2,646,037	.....	$ 405,236


~ Chart No. 17. ~
Chart showing comparative rates per message for direct line measured service business telephones, according to quantity used per year, proposed by Chicago Telephone Co. and Manufacturers' Telephone Co.
Chicago Telephone Co.
Manufacturers' Telephone Co.
C. T. Co.
M. T. Co.
Price, in cents.
Number of messages per year.
0
1
2
3
4
5
1000
1200
1400
1600
1800
2000
3000
4000
5000
6000
7000
8000
9000
10000

have therefore not gone into a farther study of such a plan. Our Chart No. 17, compares the average prices per message under the measured rates proposed by the Manufacturers' Company with those proposed by the Chicago Telephone Company, from which it will be seen that the measured rates of the two companies make substantially no difference up to a use equaling 2,500 messages per year (which is within the range of ordinary users), while for greater use, the rates of the Manufacturers' Company fall lower than those of the Chicago Telephone Company, and for a use of 10,000 messages per year, they are approximately ten per cent. less. This difference is made possible by the fact that the conditions in the franchise proposed by the Manufacturers' Company insures to them a renewal of their grant at its expiration or a reasonable payment for the property, whereas the conditions in the franchise proposed by the Chicago Telephone Company does not contain any such provision.

Regarding the possibility of constructing such a plant as planned, within a period of two years from the granting of a franchise, we report that we have considered this matter carefully, have advised with some well known telephone engineers who have been engaged with extensive telephone construction work, and have come to the conclusion that such a project would be practically impossible of accomplishment. The Manufacturers' Company has furnished us with letters from various manufacturers and dealers in materials and supplies of the kinds necessary for the construction of the plant, each of which states that that particular manufacturer or dealer would be able to supply his share of the material or equipment needed within the time specified; but our experience with dealers and manufacturers leads us to the conclusion that such promises as these are seldom fulfilled, and that when large quantities of supplies, such as would be necessary for the construction of this plant, are required within a comparatively short time, they are to be had only by the payment of premiums, and often can not be had at all within the time that they are desired. The selection and purchase of thirteen building sites together with the preparation of building plans, etc., and the construction of buildings it is believed would require of itself upwards of eighteen months. The matter of securing the necessary amount of skilled labor for the construction of the plant as proposed, within the time limit of two years, would be very difficult and perhaps impossible.

We believe that it would require at least four years to construct and put into comprehensive operation a telephone system that could successfully replace the present service of the Chicago Telephone Company.

II.

THE RELATIVE ADVANTAGES AND DISADVANTAGES OF FLAT RATES AND MEASURED RATES FOR TELEPHONE SERVICE.

In order to give the best possible telephone service, the following features should be maintained at the highest possible standard by the company furnishing the service:

The telephone plant should be engineered and constructed along broad lines, and with ample facilities for handling the business and taking care of future development.

There should be provided suitable means for quickly and accurately connecting and disconnecting subscribers' lines.

There should also be provided suitable means for accurately signaling the subscriber desired without the knowledge of any other subscriber.

All lines should be free from inductive disturbances, and of sufficient carrying capacity to provide for a high standard of transmission.

The speech transmitting and receiving devices should be of the best quality, and carefully maintained.

The plant should be well constructed and maintained.

The number of cut-offs which interrupt communications should be reduced to a minimum.

The number of "busy reports" and other unavailing calls should be reduced to a minimum.

All interference with conversation between subscribers should be reduced to a minimum.

The work required of the subscribers should be reduced to a minimum.

All of the plant employed in providing service should be under the control of one corporation or organization.

The company furnishing the service should provide courteous treatment to all of its subscribers, and should promptly and fully follow up and satisfactorily adjust all complaints.

An accurate directory of subscribers' telephone numbers should be provided.

The term flat rates in telephone service ordinarily means the manner of charging for service which consists in making a fixed charge per year for furnishing the subscriber with a telephone instrument in his place of business or residence, and a suitable line or lines and means for connecting, so that he may converse with other subscribers at will. This price is a survival of the idea that a telephone company rents apparatus and telephone lines, and is based upon the theory that the cost of providing service for any subscriber to a particular class of service will be very nearly equal to the average cost in that class of service. The subscriber with this arrangement is authorized to make as frequent or infrequent use of his telephone as his requirement or

convenience warrants, and all subscribers of the same class are presumed to pay the same price. The warrant for this equality in the price charged subscribers who may make use of their telephones in widely different degrees, lies only in an assumption that the expense of the service is almost altogether a matter of providing the lines and the apparatus, and that the cost of providing each subscriber's service is practically independent of the number of times the instrument may be used for communications. SEE BELOW

By measured rate service is ordinarily meant a service which is carried on upon the assumption that the telephone company is organized for the purpose of giving telephone service, as distinguished from the renting of instruments and lines. This, in our view, is clearly the proper duty of the telephone company, and any franchise granted to a telephone company should be drawn from this view. The provision of instruments and lines, and the other articles of equipment of the telephone company, is made purely for the purpose of enabling subscribers to transmit messages between each other with the greatest practicable convenience and dispatch. It is therefore the transmission of messages which constitutes the duty of the telephone company, and the measured rates go upon the assumption that the telephone company should be paid for the performance of this specific duty.

In connection with the measured rate service it is, of course, obvious that the company must furnish its subscribers with suitable telephone instruments and lines, and also provide the necessary equipment for making connections to complete the intercommunications between subscribers, and for this reason it is appropriate for a company making measured rate charges, to exact a guarantee that there shall be not less than a fixed minimum number of messages or that the rate paid for service at each telephone shall not fall below a certain reasonable amount per annum. This amount will include the transmission of messages up to an appropriate number, over and above which an additional small charge may properly be made per message.

The ideal method of charging for telephone service is obviously to charge each customer in proportion to the service he receives from the company, and to make the charges of all customers as low as is consistent with the operation and maintenance of the property, and the payment of a fair return on the money invested. When flat rates are charged, two classes of customers are ordinarily differentiated, namely (a) business customers, and (b) residence customers. In each class there may be subdivisions due to the arrangement of individual customers on a single line or two, three, four or more customers on a party line, but none of these subdivisions can be made except on the basis of differences in the amount of equipment required for each customer. It is true that the differentiation between a business customer and a residence customer, which is oftentimes made, is justified on the ground that the residence use of telephones averages smaller than the business use, but no grading as between the different business establishments, or between one

residence and another, can be made by that process when flat rates are adopted as the method of charging the subscribers. The result of this obviously must be, assuming that a company's total receipts are sufficient to pay for the cost of operating and maintaining its property and paying interest on the money invested, to give some of the customers on the flat rate a great deal more service than others receive, so that the smaller users manifestly pay more than their service should require, while the larger users who keep their telephones constantly busy, receive a service of much greater value and expense to the company than is justified by the annual bills which they pay. These large consumers under the flat rates also interfere with the traffic of the smaller users by keeping their lines so busy that the smaller users are unable to conveniently get into conversation with the busy lines, thus causing unavailing calls for connections which are expensive to the company and annoying to the customers.

The greatest range of rates that it is possible to make with the flat rate arrangement is relatively small, the difference between the highest paying flat rate customer and the lowest paying flat rate customer being comparatively small, and this tends to retard telephone development and prevent its general use.

The measured rate arrangement manifestly makes it possible to reduce the price of the telephone to the small user to the smallest possible annual charge, that is, to a charge which is just sufficient to cover a reasonable interest and depreciation for the portion of the plant that must be set aside for the use of that individual user (or the average of the users in his particular class), increased by an amount which is proportional to the actual number of messages transmitted from his telephone in the year. It is only by this arrangement that large city service may be extended to the small business men and the small residence and apartment dwellers who may be unwilling to pay more than from eighteen to twenty-four dollars per year, and this sort of customers constitutes a remarkably large proportion of the total telephone-using population of a large city like Chicago. When the measured rates are introduced exclusively, and carried to their logical conclusion, it may increase the cost of telephone service to the largest business users, but these users are even then charged no more than the actual service rendered to them costs the company, plus an appropriate amount to represent interest on the investment; and it is an obvious business principle that each class of service should not only be satisfactory to the users, but should also return its reasonable proportion of remuneration to the company furnishing the service.

In the discussion below, we have endeavored to point out by the use of charts, some of the features pertaining to the flat rate and the measured rate, so as to show the way in which the measured rate tends toward the diffusion of telephone service which makes it of greater advantage to the people of the city considered as a whole, while the flat rate tends toward its contraction.

Our charts, Nos. 1 and 2, show the growth of population of the City of Chicago in the past, and the estimated future growth. Chart No. 1 shows by the black dots the population given by the United States census at the end of each decade, and the open circles which are joined by lines show the population given by the school census reports. The full curved line indicates the average curve of growth of the city. It will be seen from this chart, that the city population has been growing at a tremendous rate during the last decade, and that it shows no tendency to hesitate in its growth. Chart No. 2 shows the probable future growth of the city, curves A, B and C corresponding with the estimates given by Mr. Bion J. Arnold in his report on the traction situation, starting at an assumption of 2,100,000 inhabitants in the year 1902. Curve D shows an estimate of future city growth made by City Statistician Grosser, for our use. It starts from the figure of the federal census of 1900. Mr. Arnold's average curve (curve B) and Mr. Grosser's curve cross each other at the year 1928, and the indication of the curves is that the population of the city will not be far from 5,000,000 inhabitants at that time, and that it will probably exceed 5,000,000 inhabitants by as much as a quarter of a million by the opening of 1929. Mr. Arnold's lowest curve, curve A, indicates a population at the opening of 1929, of approximately 3,750,000. It may be expected that the population at the opening of 1929 will therefore be as much as 5,250,000, and certainly not less than 3,750,000. At the present time (1907), the telephone development in the City of Chicago shows between five and six telephones for each 100 inhabitants. It is our opinion that this development will expand with improved and cheaper service, until there are at least ten telephones for each 100 inhabitants, and the telephone development which must be planned to occur before the opening of 1929, should be made with a view of providing the system with as many as 500,000 telephones and perhaps 600,000 telephones. Four hundred thousand telephones is too low an estimate to be reasonable, especially in consideration of the fact that a first class and cheapened service is likely to increase the number of telephones beyond ten per 100 inhabitants, and may increase the development to a point where as many as fifteen telephones will be introduced to that number of inhabitants. Charts Nos. 12, 13 and 14 illustrate the way in which the telephone development has heretofore increased as the price of service has fallen. The consideration of the manner of charging must therefore be made with due prevision of the tremendous number of telephones that an operating company will be called on to provide within a few years. It is our belief that the number of telephones in the City of Chicago should exceed 300,000, and perhaps exceed 350,000, when the population of the city is about 3,500,000. Within twenty years, as we have pointed out, 400,000 is too small an estimate of the number that should be in use in the City of Chicago, and the number may exceed 500,000. These estimates are

founded on the presumption that a franchise will be granted to a company with conditions requiring adequate service over the entire city.

Our Chart No. 3 shows the way in which the area of the City of Chicago has been growing. The area is given in square miles. Upon the absorption of territory in April, 1899, the total area within the city limits, according to the City Statistician, became 190.638 square miles. From 1837 to 1889, the area of the city had a steady increase. In July, 1889, a very large area was added to the city and, since that time, the area has been gradually increasing in a small degree. From 1889 to 1899, ten years, the area of the city had increased practically twenty square miles, which is at the rate of two square miles per annum. If farther additions are made to the area of the city at the latter rate, by the opening of 1929, the area of the city will exceed 225 square miles. That is, it may be expected that the telephone service will not only become much more widely used within the present city limits, but the city limits may be expected to extend somewhat, and thus require additional considerations in dealing with the subscribers.

The growth of the number of telephones in the City of Chicago is shown by the Chicago curve on chart No. 4, to now be going on at a rate of nearly 30,000 telephones per year, and the development has been going on at an average rate of nearly 20,000 telephones per year for five years. During the next five years we believe that the growth in the number of telephones will go on at the highest rate yet attained and perhaps the rate will increase, provided the service can be made sufficiently inexpensive for the smaller users, and the quality of the service can be maintained or improved.

Our chart No. 5 indicates the way in which the total number of calls emanating from the telephones in the Chicago exchange district has increased steadily since 1893. For the purposes of this and following charts, a call is counted each time a subscriber takes his telephone receiver from the hook and his signal is answered by an operator. With this increase in the number of calls there has been a corresponding increase in the cost of handling the traffic, and the only way immediately open for reducing the expense is to bring about a reduction in the number of calls. As the number of telephones increases, the calls will increase at a more rapid rate unless every reasonable effort is put forth to prevent useless and frivolous calls from the telephones. Of the total number of calls each week day, which at present average nearly a million in the Chicago Telephone exchange district, about one-third of the traffic as now handled constitute unavailing calls, that is, calls which are made by subscribers but prove to be futile efforts and do not mature into messages because the line called for is found to be busy or the called for subscriber fails to answer or any of the various other fertile reasons for the failure of a call to be completed into a message. Each of these calls means cost for the operations performed. To bring about good and cheap telephone service it is necessary to reduce these unavailing calls to the lowest possible number, and

especially to reduce the frequency with which called for lines are found to be busy. Such "busy reports" now constitute in Chicago about one-half of the total unavailing calls and are in excessively large numbers, averaging about sixteen per cent. of the total number of calls, which is in a large degree due to the tremendous use of the telephones under the flat rates now prevailing. It is obvious from our examination that the Chicago Telephone service is burdened by an expensive and undesirable parasite of useless telephone calls which must be removed before the service can be made the most satisfactory and the price of the service can be reduced to a mimimum.

The frivolous and useless messages can be largely cut off by making measured rates of service, since even a small charge per message becomes a marked deterrent to the needless use of the telephone. This is illustrated by the line representing the average number of daily calls made from each telephone, shown on our chart No. 5. The number of telephones has been steadily increasing in Chicago, and the total number of telephone calls per day has also been steadily increasing, but the average number of daily calls emanating from the individual telephones began to decrease in 1899 and has decreased from an average approximating sixteen calls per telephone per day to an average approximating nine calls per telephone per day. The time that this decrease began is concurrent with the introduction of measured rates, and during the four years while the measured rates were coming into vogue the average daily calls per telephone in the city were steadily decreasing until they have now reached an apparently fixed value that is determined to a considerable degree by the remaining flat rate telephones which involve an over use of the lines.

In these charts it will be observed that a point is marked on each of the curves for the months of February and August of each year, with the exception of the year 1898 during which no records were kept by the Chicago Telephone Company. These points were fixed by what are called "peg counts," taken on one day in August and one day in February to determine the total number of calls coming into the exchange. The counts are made by each operator keeping a record on some counting device of the aggregate number of calls coming to her position during her hours of service, and the total numbers thus given are plotted on our chart No. 5. The average daily calls per telephone are derived by dividing the total number of calls per day upon each of the dates of the "peg counts" by the number of telephones then in use in the city. It will be observed that the zigzag lines representing total calls per day and average daily calls per telephone rise and fall, ordinarily being higher in each February than either of the points corresponding to adjacent Augusts. This is because the telephone business in Chicago is larger in February than in August, since February is a month of great business activity and August is a month during which the business activity is reduced.

It must be borne in mind that in all these charts giving the total calls per

day and the total calls per telephone, the data relate to "peg count" calls, which include all of the unavailing calls in addition to those which have become messages, and that APPROXIMATELY ONE-THIRD OF THE DAILY CALLS IN THE CITY OF CHICAGO ARE UNAVAILING, one-half of the unvailing calls being caused by the over use of lines which are reported busy.

Chart No. 11 shows a record of observations made for the purpose of learning the relation between the number of times a line is used in an hour and the number of times the line is reported busy during the hour. By the phrase, the number of times a line is used in an hour, we mean the number of actual messages, outgoing and incoming, which pass over the line in the hour. Chart No. 11 is plotted from data collected by the Chicago Telephone Company through a special observer, who kept up a series of careful observations on several hundred lines. The data observed have been plotted, using the number of messages passing over the line, that is, the number of times the line was used in an hour, on the horizontal axis and the number of times during the hour the line was reported busy on the vertical axis. Each circle laid down on the plat represents the averages of a number of observations as shown in the table accompanying this chart and the observations represent data derived from numerous lines, so that the points may be assumed to be fairly accurate in representing the facts. The circles represent the average data obtained and we have drawn a curved line to represent the average of the positions of the circles. It will be observed from this curve on the chart that if a line is used eleven times an hour it may be expected to be reported busy at least twice during the hour to calling subscribers who desire to communicate with that line; but if it is used twenty-one times an hour it may be expected to be reported busy not less than ten times. This plainly shows that the unavailing calls increase in a tremendous ratio as the load on a telephone line increases.

Our chart No. 11 is based upon the number of times a line is used in an hour, but we will point out here that almost all lines that are used in flat rate service, are very much busier during one hour of the day than during any other hour of the day; that is, a large proportion of the total calls over a telephone line during a day are made within certain specific "busy" hours, which makes the busy reports much more numerous during certain parts of the day than the average number of calls might indicate.

Chart No. 6 shows the growth since August, 1901, of the different classes of service in the Chicago exchange district (that is, excluding the neighborhood exchange telephones). It will be observed that during this period ten-party line telephones, which are nickel prepayment telephones, and therefore belong in the measured rate class, and the other measured rate telephones, have increased steadily. The private branch exchange telephones have also increased, and a considerable portion of these also belong in the measured rate classification. The flat rate business and residence telephones have not increased in a large degree. We were not able to obtain the actual data for the

two preceding years, but the measured rate service was proportionately increasing during those years, it having been first introduced about 1899; and our chart No. 5 shows that during these years' increase of the measured rate service, from 1899 to 1906, the average number of calls per telephone per day has consistently decreased. This has helped to make it possible for the Chicago Telephone Company to steadily decrease the average charges per telephone within the Chicago exchange district. That such a decrease has occurred is plainly to be observed from our chart No. 12, which shows two curves, one indicating the average number of telephones in use in Chicago during each year from 1897 to 1906, which is indicated by a rising line from left to right as the dates advance, and another curve showing the average rate paid per telephone during the year, which is indicated by the falling line as the dates advance. The average rate paid in 1897 was $123.53, as indicated on the chart, and it has fallen year by year since, until it has now become as low as $53.29. The figures on this chart do not include "neighborhood" telephones.

With continued careful management, improved methods of keeping records for the determination of the costs of the different classes of service, and a greater extension of the measured rate service, we believe that the Chicago Telephone Company, in case it should be granted a franchise, can continue this decrease in the average yearly rate that the subscribers pay per telephone, until the average yearly rate does not exceed forty dollars, or perhaps less, and a large proportion of the telephones will be paying not more than eighteen dollars per year. On the other hand, our study of the problem convinces us that an extension of the flat rate telephone service would tend to so greatly increase the useless calls over the telephones, and so overload the lines, that the unavailing calls would increase tremendously, making the daily calls per telephone even larger than they were in 1896, and thus increase the annual expense of the service so largely that the average price per telephone would be given a tendency to rise instead of fall.

It is a tradition in telephone circles that the service per telephone costs more as the number of telephones connected with the plant increases. As the number of telephones increases, each subscriber has the opportunity to call upon more people by telephone, and the law of averages would indicate that the number of calls per day from each telephone should increase, thus making the service more expensive to the operating company, provided the service is flat rate service and unnecessary use of the telephone is not deterred by a measured rate charge. This condition seems to have worked out in practice, according to the statements of telephone companies at Cleveland, Indianapolis and elsewhere, and flat rate service seems to increase in cost per telephone as the number of telephones attached to a system increases.

On the other hand, a different condition exists in connection with measured rate service. With the measured rate service the message is the unit

instead of the rental of the instrument; and it is the message that the subscriber ought to pay for, because it is for the purpose of sending his messages that he provides himself with a telephone. With measured rate service, and a reasonable use of the telephone lines, the unavailing calls are reduced to a minimum. The number of calls per telephone per day, apparently, are not inclined to increase as the system increases in extent. This is illustrated in our charts Nos. 9 and 10. But the total number of messages handled increases approximately in proportion to the number of telephones. Under these conditions, the ordinary laws regulating the difference between the cost of producing articles in large and small quantities comes into play, and the actual cost per message ought to steadily decrease. Since it is the messages that are paid for under the measured rate system and the actual cost per message ought to steadily decrease as the system enlarges, the average amount paid by each subscriber will decrease if the subscribers limit the use of their telephones to their actual needs, and the telephone company is well managed.

The difference thus arising between flat rates and measured rates is very marked. The flat rate telephone user tends to increase his number of messages as the system enlarges, so that the average calls per day per telephone may be expected to increase and the proportion of unavailing calls also to increase. The consequence is that the company is forced to handle more calls per telephone as the system becomes larger, and the price per telephone has to increase under flat rate charges; while the subscribers limit their use of the telephone to their actual needs under measured rates and the number of calls per telephone does not have a tendency to increase as the system increases in size after it has reached a considerable development such as is now found in the City of Chicago. Under these conditions the principle of wholesale production makes it possible for the company to reduce its cost of operating per message and thereby reduce the average price charged the telephone subscribers.

The telephone hanging on the wall appeals to the average telephone subscriber as constituting the total expense to the company through the maintenance of the instrument and lines. The maintenance and the interest on the equipment does constitute a considerable expense to the company, but a great deal of the expense to the company is due to the actual cost of handling each message. This expense composes a large proportion of the annual expenditures of the Chicago Telephone Company.

Moreover, the more calls that are made per line, the larger must be the switchboards provided by the company for making connections for communication between subscribers' lines, since each operating employe can only take care of a limited number of calls per day, and if the number of calls per telephone increases, each operating employe can take care of the requirements of fewer lines. As the operating employes are increased, the switchboards must be increased at large expense to afford additional operators' positions,

and all of this increases the annual expense for telephone service. The deterrent of a small charge per message, varying from a nickel downwards depending upon the number of calls used per year, is sufficient to overcome much of this difficulty and to reduce the telephone service to a fairly uniform and business-like basis.

We think that the Chicago Telephone Company has involved itself in considerable unnecessary expense by apparently encouraging its subscribers to make calls upon operators for various items of information. The record of a count made in November, 1906, shows that more than 42,000 requests for the "time of day" were made of the operators on that day. The expense of this service would go far toward keeping the subscribers who asked the time of day supplied with clocks; and various other much repeated enquiries apparently aggregate an equal expense.

In further illustration of the relation of the number of calls made per telephone by different users, we have had some additional charts made from the data which we have gathered together.

Chart No. 7 shows the number of flat rate lines and the number of measured rate lines in the Chicago exchange district. The flat rate lines include what are known as commutation trunk lines, namely, lines from private branch exchanges which are used for outgoing messages only; and the measured rate lines do not include the ten-party lines, which we have put upon a separate chart (No. 10). It will be observed that the number of measured rate lines is rapidly increasing compared with the number of flat rate lines.

Chart No. 8 shows the total numbers of calls per day originating from the flat rate telephones and from the measured rate telephones connected with the lines illustrated in chart No. 7.

Chart No. 9 shows the average numbers of daily calls per line and per telephone on the flat rate lines and on the measured rate lines which are illustrated in chart No. 7; and this chart indicates the large difference which exists between the two kinds of service now current in Chicago in respect to the number of calls per line or per telephone per day. The average number of calls per line on the flat rate lines is steadily increasing, thus increasing the annual expense to the telephone company per line, though the price charged to the flat rate subscribers remains independent of the use of the telephones. The numbers of calls per line and per telephone on the measured rate lines show different characteristics. The number of calls per telephone per day is steadily decreasing toward an apparent minimum limit of approximately six calls per telephone per day, thus decreasing the cost to the telephone company and making it possible to make marked reductions in the average price per telephone.

Chart No. 10 shows the number of ten-party telephones, the total number of calls per day originating from these ten-party telephones, and the average number of calls made daily per telephone. This shows that in this service

the number of calls made daily per telephone is remarkably low, and the price of this service may properly be made correspondingly low.

There is another feature which relates to the question of relative use by flat rate and measured rate users of telephones. It is impracticable to connect all telephone subscribers in a great exchange system, such as is found in Chicago, with a single office, and it becomes necessary to arrange means for transferring calls made by the lines in one office to the called-for subscribers' lines in other offices. This is ordinarily denominated "trunking" the calls between the offices, and it involves a double expense for operators, since one operator is required to receive the call of the subscriber at the originating office and another operator is required to complete the connection to the called subscriber's line in the second office. As the system increases in number of telephones, the proportion of "trunked" calls is likely to increase. We have illustrated this in connection with our Chart No. 15, which shows the way in which the "trunked" calls, marked "B calls" on the chart, increase as the service extends. This Chart No. 15 shows the daily number of "B calls" according to the "peg counts" of February and August for a number of years back, and it will be observed that the number of "B calls" consistently increased during this period. This chart also shows the number of measured rate calls originating from subscribers' lines and the number of flat rate calls originating from subscribers' lines, and it will be observed that the number of flat rate calls has increased year by year at a rate approximately equal to the increase of calls from measured rate lines, although our Chart No. 7 shows that the number of flat rate lines has not been increasing as rapidly as the measured rate lines. Chart No. 15 also shows that the rate at which "B calls" or "trunked" calls increase corresponds more nearly to the rate at which the flat rate calls increase in number than to the rate at which the measured rate calls increase in number.

The indications that are afforded by Chart No. 15 are likewise afforded by the series of load curves which we have given. A load curve is a curve showing the number of calls occurring within a telephone exchange during each hour of the day. We have plotted the load curves for the "peg count" taken on August 3, 1906, in all the telephone exchange offices of the city, giving separate curves representing the measured rate calls, the flat rate calls, and the incoming trunked or "B calls" for each exchange. We have also given a line showing the sum of the measured rate and flat rate calls for each exchange on that day. We include a number of typical load curves with this report. The Chicago Telephone Company makes a "peg count," as heretofore indicated, once a month, and we have given the load curves for the "peg count" for one month, taken at random.

Load curve No. 9 gives the sum of the calls obtained from the several exchange offices in the Chicago exchange district. The curves are shown as the total number of calls originating on all the subscribers' lines (marked "A"

calls) on August 3rd, 1906, during each hour of the day, the total number of measured rate calls during each hour of the day, the total number of flat rate calls during each hour of the day, and the total number of "trunked" or "B" calls coming in to all of the exchange offices during each hour of the day. A point on each of these curves indicates the number of calls of the particular class during the corresponding hour of the day. The indication of "B" calls on the load curves for the several separate exchange offices, does not afford any means of telling from what sort of a line the original calls emanated, because records of the trunked calls are only made at the receiving office, while the sending office (where the "B" call is not recorded) is the only one which could determine from what sort of a line a trunked call emanates. But the total load curve makes it possible to compare the total trunked calls with the total flat rate and the total message rate calls, and it will be observed that the number of trunked calls corresponds closely to the number of flat rate calls. This is probably an indication that the greater proportion of the trunked calls come from the flat rate lines, and that these lines are consequently causing more than a proportional share of the double expense of the trunked calls. We have studied this question from the records of the Chicago Telephone Company extending back over the period since the introduction of message rates in Chicago, and in each year find a similar indication, namely, that the trunked calls correspond more closely to the flat rate calls, and that the flat rate lines apparently therefore should be properly charged with the larger proportion of the expense of the trunking service and maintaining the trunking plant.

In passing, we will call attention to the complexity of the service indicated by these load curves. It will be noticed that the load curve for Harrison exchange, which is in the business portion of the city, and is typical of the load curves at Main, Central and Harrison exchanges, shows extended peaks of traffic; that is, it shows a very large number of calls at a particular hour, about eleven o'clock in the morning, and that business falls off rapidly on either side of the peak. There is another peak in the afternoon in each of these exchanges. In the exchanges like Wentworth, Hyde Park, Douglas and Lake View, there comes a relatively high peak between seven and nine o'clock in the evening, apparently due to the demands of social intercourse between the families of subscribers.

These great variations in the hourly use of the telephone increase in a marked degree, the cost per message for operating, because the telephone company must always have sufficient operators on hand to meet the requirements of the hour, and must have a sufficiently large switchboard to enable it to handle all the calls which arrive at the busiest hour. Even with the best arranged schedule for the operators' work, it is impracticable to arrange for operators to be on hand for only one or two hours in the morning and one or two hours in the

afternoon, but the operators must be put at work for a considerable number of hours at a time, so that the irregularities of the load curves which run up into high peaks increase the cost of operating on account of increasing the average number of operators that must be kept on duty in proportion to the total number of calls per day, and also increase the cost for interest and maintenance on account of the extra switchboard positions required to enable these extra operators to perform their work.

A scrutiny of the load curves of the various exchange offices and especially of the business offices, indicates that the greatest proportion of the peak of the load in each exchange office comes from the flat rate users, and that the measured rate curve is more uniform over the period of the day. This absence of peak makes it possible to perform the telephone service more economically, and the present measured rate users are therefore less expensive users to whom to supply service. A measure of the expense of the operating is to some degree indicated by the ratio of the maximum number of calls in the busy hour to the total number of calls per day in the exchange. This ratio is larger for the flat rate calls than for the measured rate calls in the Chicago exchange district. As shown by the twelve "peg counts" for 1906, the average ratio for the total number of originating calls is .1072, the ratio for the flat rate calls is .1185, and the ratio for all measured rate calls, including ten-party lines, is .0991, which indicates that the cost of operating for the measured rate calls is less than the cost of operating for the flat rate calls. Other peg counts show similar results.

Service inspection tests from the New York City exchanges, which are operated almost entirely on the measured service basis, show that the proportion of unavailing calls there is only about one-sixth of the total calls, and that the proportion of calls receiving busy reports is one-twelfth of the total calls. A comparison of peg counts for these two exchange systems indicates that the expense for traffic employes per station is lower in New York than in Chicago, and we conclude that this difference must be due to the measured rate method of charging for service.

We have pointed out earlier, certain cogent reasons why the line of the average flat rate subscriber costs the telephone company, as a rule, more than the line of the average measured rate subscriber, largely on account of the overloading of the lines and the increase of the unavailing calls by the flat rate subscribers' use; and the foregoing study of the load curves indicates farther that the way in which the calls become distributed in the system makes it possible for the telephone company to arrange its operating force more economically to take care of its present measured rate service, and therefore actually enables the telephone company to make the cost of operating less per individual call of the measured rate service than it can for the flat rate service.

On the flat rate basis the telephone subscriber who makes calls over his telephone line twenty or more times per day (perhaps even fifty or one hun-

dred or more times) pays the same price as the subscriber who uses his telephone only eight or ten times a day, and the flat rate being an average rate which enables the telephone company to come out at the end of the year with its expenses all paid and a balance to pay interest on its investment, it is obvious that the small user pays more for his telephone than his use makes necessary and the largest user pays less for his telephone than his service probably costs the operating company. This is so manifestly unfair that there can be no justification in maintaining a strictly flat rate telephone charge in large cities, with the present known methods of operating. Such charges for telephone service are as unjust as similar charges would be if made for electric light or gas. It will be recognized as absurd to suggest that a gas company should charge a fixed rate per year for each gas burner in a place of business, regardless of the number of hours that the place of business is open. The differences between the amount of gas used per burner in a store that closes at 5:30 p. m., and in a saloon which closes at midnight, or between an office which is on an upper floor of some well appointed and well lighted office building and a shipping room which is in the basement of the same building, are so great that it is manifest that this flat rate method of charging would exercise the utmost injustice between customers—affording a long hour user a large amount of gas at a price which might not pay the company for the expense of the manufacture thereof, while the short hour user, paying the same price per burner, would be paying an extremely excessive price per cubic foot for the gas in order that the losses entailed by the long hour user should be recouped to the company. This method of charging was in vogue by electric light companies in the earlier days of electric lighting, before electric meters were reasonably perfected. It was then usual to charge business houses a fixed rate per incandescent lamp installed and connected to the lines, and residences a different and smaller rate per incandescent lamp installed, the assumption being that the residence would use the lights for fewer hours per day. This method of charging brought many electric light companies to the verge of bankruptcy, and as long as it was in vogue electric lighting remained a luxury. With the advent of charges for actual consumption (that is, measured rates), electric light came within the reach of the greater proportion of people who now use it, and the expansion of the electric lighting service was brought to a reasonable mark.

The meter question is one which creates some difficulty in the telephone field. Nickel prepayment telephone boxes provide for a large number of users. There are now in use in Chicago over 68,000 nickel prepayment telephones, and the number is apparently steadily increasing. In New York City the measured rate lines are individually equipped with meters in the exchange offices, and the Chicago Telephone Company has developed a meter which makes it impossible to register more than a single unit for each message over the line. We believe that this meter used in connection with the meas-

ured service lines that are not equipped with prepayment boxes will prove accurate and satisfactory, in case the City Council grants the Chicago Telephone Company a franchise. This meter is arranged in such a manner that no record can be made until the connection with the subscriber's line has been set up in the manner required for making a communication. Thereupon the operator by pushing a button may cause the meter to register one unit, and however many times the button may be pushed thereafter, through oversight or malice of the operator, no additional messages will register on the meter until the connection has been taken down after the completion of the message and a new connection has been made, as upon receiving another call from the subscriber. This guards against an excess number of calls being registered against any subscriber through oversight on the part of the operator. We see no reason why this meter arrangement should not prove commercially accurate and satisfactory, and we recommend its adoption for the instances of metered lines in case the Chicago Telephone Company should be granted a franchise.

We have allotted a great deal of time to the study of this question of rates and are convinced that the general use of measured rates results in improvement in the service by the reduction of unavailing calls and also results in the reduction of the average cost to the consumers through the elimination of useless calls from the various stations, and makes it possible to place the lowest rate for the least expensive service within the means of the largest possible number of people. We are also convinced that the general adoption of measured rate service will bring about a more uniform rate of calling during the day, which will make it possible to ultimately reduce the price per message, thus bringing about a further reduction in the average cost of telephone service and especially a reduction to the large class of users which subscribe for telephones of the lowest cost.

A partial application of flat rates is practicable in connection with business telephones which have sufficient service to make it worth while to set aside a special line or lines for outgoing calls only, since such lines do not interfere with the convenience of others, and do not cause a piling up of unavailing calls, because their busy state in no wise affects calls coming from other lines. Such flat rate outgoing service lines must in each instance be accompanied by a sufficient number of incoming lines, to be furnished at a relatively small rental. A partial application of flat rate service may also be applied in connection with residence telephones and with neighborhood exchange telephones, and is here justified because the restricted character or restricted circle of use makes the average calling rate per telephone relatively small and approximately equal for all users of the same class. In connection with residences this use of flat rates in a large city has some serious disadvantages, but its advantages probably overcome the disadvantages.

We gave some consideration to the telephone rates and grades of service in foreign countries, but found no basis for useful comparisons. The London

telephone system is the only one comparable in size with the service given in Chicago, and it has only recently been brought to comparable magnitude. The measured rate seems to be there preferred by the engineers. The service in Paris and Berlin is notably bad and the numbers of telephones are few. In some of the smaller foreign cities the service is apparently good, but good foreign service does not partake of the speed and accuracy demanded by American telephone subscribers. The slower speeds reduce costs; zone charges are commonly used, and the wages of employes are lower; and it is impossible to make an intelligent analytical comparison of the foreign with American rates.

III.

THE APPLICATION OF THE CHICAGO TELEPHONE COMPANY.

The application made by the Chicago Telephone Company differs from the application of the Manufacturers' Company in consisting essentially of an application for a renewal or extension of franchise for twenty years, by a company now in the position of operating an extensive telephone plant in the city of Chicago. We have directed our attention very fully to the reasonableness of the provisions in the franchise asked for by this company, and especially those provisions that relate to the proposed schedule of rates, the regulation of rates by the City Council, and compensation to the City.

We have also inspected the plant of the Chicago Telephone Company as far as the time afforded us would warrant, and have given considerable attention to their methods of operating.

The book value of the entire fixed plant, including real estate and buildings, of the Chicago Telephone Company on December 31, 1905, aggregated, according to the report of the City Auditor, $15,827,033.42. The company's construction account for the year 1906, to be added thereto, amounted to $3,343,673.88 according to the statement of the company's auditor. The City Auditor has examined these expenditures and traced the charges, and has found that they are properly posted and agree with the statement submitted. Our examination of the plant leads us to believe that the figures are correct.

Subtracting $700,000, which was written off by the company for depreciation for the year 1906, makes a total book value for fixed plant, including real estate and buildings, at the opening of 1907 of $18,470,707.30. This is the valuation shown on the books of the company for the entire system, which gives service to 170,834 telephones inside and outside of the limits of the city of Chicago of which 131,747 (on January 1, 1907) are within the limits of the city. The plant includes an extensive development of interurban lines, which lead between the various cities and villages in a district surrounding Chicago that is shown in our Map No. 3. This district extends northward to the Wisconsin state line, westward about forty-five miles from the Chicago city limits, and southeastward into the State of Indiana.

Within the limits of the city of Chicago the company has in operation a large number of closely interconnected exchange offices of which the company's records show that the largest (called Central office) gives (on January 1, 1907) service to 6268 subscribers' lines with 14,274 connected telephones, while the smallest, which is a neighborhood exchange and is called Mont Clare, gives (on January 1, 1907) service to nine subscribers' lines with 24 telephones connected. Our Map No. 1 shows the locations of these various exchanges and the outlines of the several districts particularly served by each. In various instances several exchange designations are included in one exchange office. This makes it possible to limit each switchboard on which the talking connections of subscribers' lines are made to a size that comes within the reasonable reach of the young women operators and to confine the subscribers' numbers to not exceeding four numerals, thereby aiding in maintaining the speed and accuracy of operating.

An instance of this introduction of more than one exchange designation into a single building is found at the exchange office located at 100 Washington street, which is called Central, and which has become crowded and is now being extended by the installation in an adjoining building erected by the Chicago Telephone Company of an additional complete unit of switchboards and wire frames. The latter switchboard will be designated as the Randolph exchange, though it is substantially one with the Central switchboard. The necessary extra expense required for this complete additional equipment is justified in order to bring the service up to a proper degree of efficiency.

Also, in other exchange offices different designations are used to indicate whether the lines are arranged for connection with one, two, four or ten telephones, the different designations being introduced particularly for the purpose of giving the operators information which is necessary to the most rapid and accurate handling of the talking connections. For instance, in the North exchange office, one-party direct and two-party lines are designated as North exchange, four-party lines are designated as Dearborn exchange, and ten-party lines are designated by the exchange designations Black and White, thus making four separate exchange designations for the lines entering the North office.

Each of the important offices of the company affords such illustrations of processes intended for improving or maintaining the service at a high quality. Our examination and observation of the service given to its subscribers by the Chicago Telephone Company shows that it is of good quality in comparison with the service of other great cities.

Much attention is given by the company to the selection and instruction of applicants for operators' positions, and they are constantly supervised after they are placed on duty. The accompanying Photograph No. 1, which shows a part of the Central exchange office and force on regular duty during the afternoon of a weekday, illustrates the manner in which the supervision of

Photograph No. 1—Part of Central Exchange

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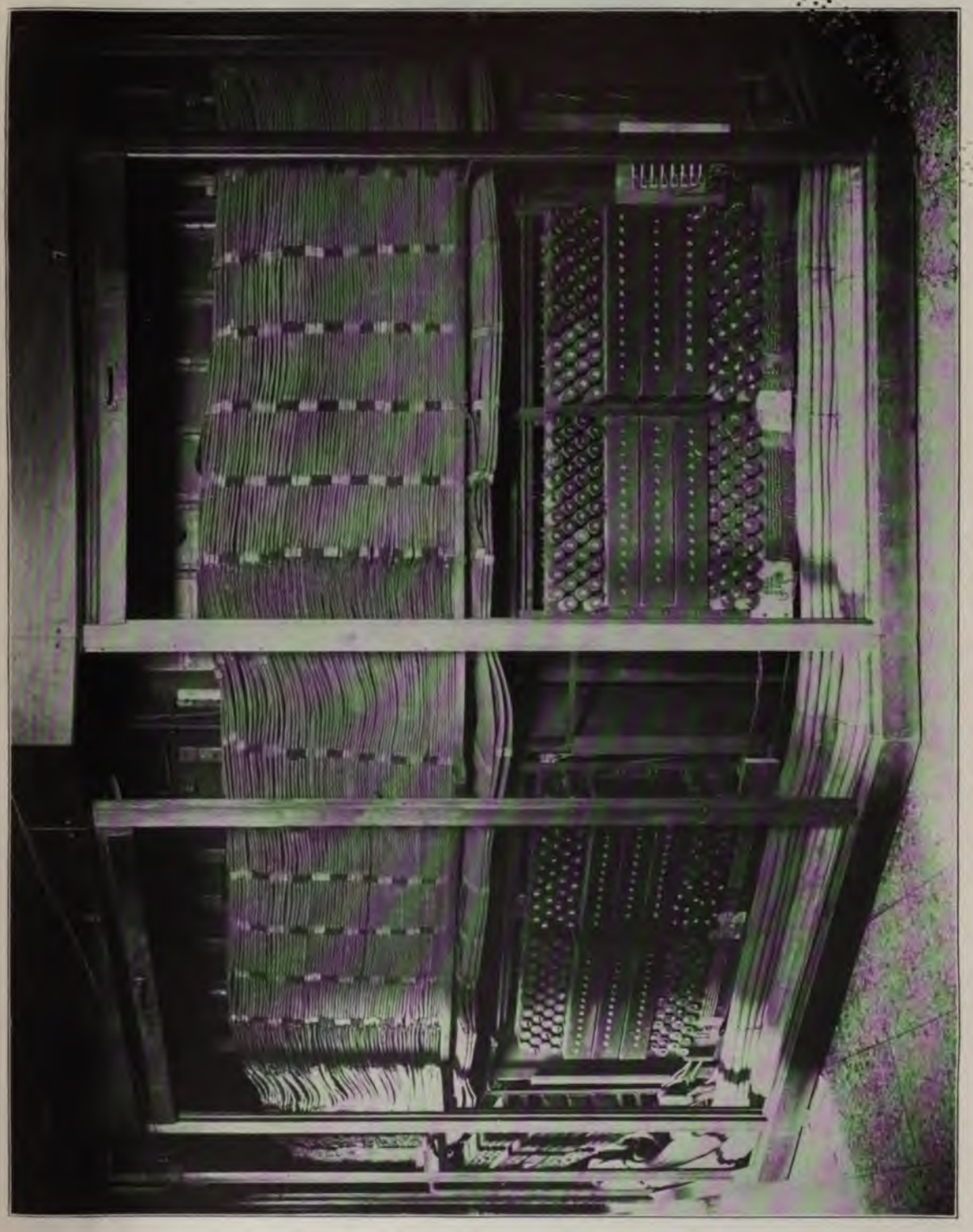
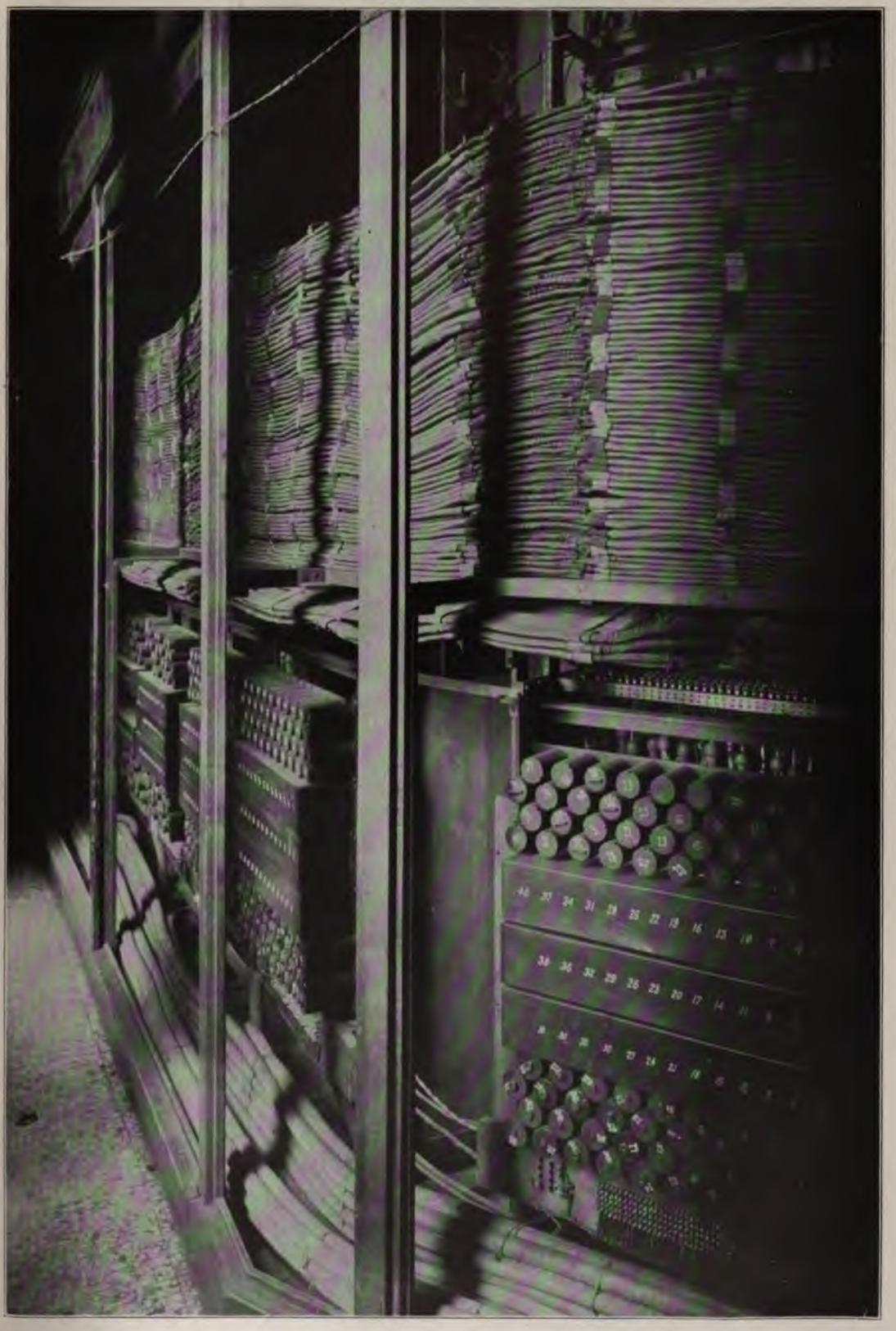


Photograph No. 2—Rear View of Portion of a Switchboard

Document Control



Photograph No. 3—Rear View of Portion of a Switchboard

operators is provided for. The young women seated in a row at the left hand are operators in position at the switchboard for making talking connections between the lines of subscribers. Whenever a call comes in from a subscriber, a small signal lamp lights in front of one of the operators. She thereupon places herself in communication with the calling subscriber, learns his wishes, and executes them by making suitable connections to enable him to get into communication with the desired person. The women who are to be seen standing in the photograph, are supervisors, each of whom has the duty of watching the performance of several operators, directing them or assisting them as may be needed. Each supervisor is provided with apparatus so that she can get into communication with any calling subscriber for the purpose of quickly adjusting any mistakes or misunderstandings which may arise through errors or haste of either subscriber or operator.

Photographs Nos. 2 and 3 show a portion of the rear of the same switchboard, and illustrate the complexity of the apparatus and wiring that is necessary for use in telephone service.

When considered from the standpoint of ideally perfect service, there are various directions in which improvement may be and should be effected in the service of the Chicago Telephone Company. At times the service seems to be unnecessarily slow, and too many operators' mistakes which result in connecting a calling subscriber with the wrong number, disconnections of talking subscribers, etc., are made. Other faults, considered from the standpoint of ideal service, seem to reside in the difficulty of operators in receiving the directions of calling subscribers, and the indistinct manner in which the operators often answer calls. The latter faults may be due either to insufficient training of the operators, or to imperfections in the speech transmitting and receiving apparatus. The other faults of the operators, in our opinion, can be reduced by more effective methods of making and recording the results of inspections of the operators' work. Permanent records of the details of each operator's work, as shown by frequent inspections, ought to be given a place of greater importance, and these records ought to be under the constant scrutiny of a vigilant traffic manager who is responsible for the employment of the operating force.

The complaints of the business methods and service of the Chicago Telephone Company which have come to our attention from various sources, including the transcript of the proceedings of your committee, lead us to the opinion that too much time is allowed by the Chicago Telephone Company to elapse between the dates subscribers' orders are given for telephones and the dates when the telephones are installed, and, also, too much time is lost or inconvenience caused the subscribers in the work of correcting faults of apparatus and lines. The company apparently does not properly follow up complaints or keep a proper permanent record of these matters. In our opinion it is essential to the maintenance of perfect service that full permanent

records shall be kept of all instances of defects arising in apparatus and lines, and the length of time elapsing before each defect is removed, and that such records shall be constantly before a competent superintendent of maintenance and his superior officers. Such records are a part of those which would come under the supervision of the City Comptroller in the form of ordinance outlined by Mr. Hoyne.

In case a franchise is granted to the Chicago Telephone Company, or any other company, by the Honorable Mayor and City Council, under terms corresponding to the ordinance outlined by Mr. Maclay Hoyne, in which we herein concur, the most important sources of faulty service that now exist will be removed. At the present time the service of the company is overwhelmed by a tremendous number of unavailing calls, that is, calls from the subscribers which never become completed messages on account of the called lines being busy, or through some similar contingency. As pointed out in our discussion of measured rates versus flat rates, these unavailing calls can be greatly reduced by the general introduction of measured rates; and the extinction of the ten-party lines with their common nuisance of mutual interference, to which a large portion of ten-party subscribers are subject, will aid in the same direction. The ten-party line traffic is particularly disturbing to the service because it is inevitably slow and subject to error. Under the present method of operation, it has been found that, on an average, it requires approximately 44 seconds for a subscriber to one of the higher grades of service to get communication with a ten-party line subscriber, and only 26 seconds to get communication with a subscriber in his own grade.

In the foregoing enumeration of the book value of the property of the company, it is pointed out that the value there given relates to the whole property of the company. The proportion of the book value on Jan. 1, 1907, that pertains to property of the company within the limits of the city of Chicago, is estimated by the engineering department of the company, to be $14,240,728.41 for fixed plant, real estate and buildings. The time which has been afforded us has been too short for us to undertake the appraisal of the property and verification of this estimate, as that would occupy additional weeks of time; but our inspections of the plant, as far as we have been able to make them, indicate that the actual value of the plant, real estate and buildings, within the city of Chicago, aggregates fully the figure given. In fact, the figure given seems to us an under-valuation of the plant, which was built largely during the times of low prices, and that an equally effective plant could not be built today for that figure, or, indeed, for less than 25 to 35 per cent. more.

The company also owns extensive outfits of construction material on hand, tools, teams, furniture and fixtures, which the books of the company at the opening of 1907 valued at $602,148.30. We have not had an opportunity to verify this figure, but our inspection indicates that probably half of the amount pertains to the business within the city.

The application of the Chicago Telephone Company is complicated by the license contract which the company has with the American Bell Telephone Company, and also the contract with the Western Electric Company whereby the latter company acts as purchasing agent for the Chicago Telephone Company. We have therefore given extended consideration to these two points.

The contract with the American Bell Telephone Company extends back to the early days of the Chicago Telephone Company's existence, and was originally drawn to cover various business relations based on the exclusive license of the Chicago Telephone Company to operate within its territory under the fundamental Bell and other telephone patents. The contract originally included royalty charges at a figure which would be extremely high today, but these have been gradually reduced. The earlier patents have been expiring from time to time, and the contract has been correspondingly modified. The American Bell Telephone Company continues to furnish and maintain the telephone transmitters (with accompanying induction coils) and receivers used by the Chicago Telephone Company, and to perform other services besides licensing the latter company to operate under existing patents, and the payment for these services and the license is being made by the Chicago Telephone Company at the rate of 4½ per cent. of its gross receipts. The amount paid during the year 1906 aggregated $351,860.68 for the entire territory of the Chicago Telephone Company, according to the statement of the company's auditor, of which $282,246.32 was paid on account of the business within the city of Chicago.

The Chicago Telephone Company reports that it had in use and in stock during the year 1906, an average of nearly 195,000 telephone sets in its entire area, and we estimate that over 150,000 of these were on account of the Chicago business. These telephone sets, each comprising a transmitter, receiver and induction coil, are worth approximately three dollars per set, and are furnished and partially maintained free to the Chicago Telephone Company by the American Bell Telephone Company, under its contract. The depreciation on these is large, and it is generally considered that the average life does not exceed a period of between six and ten years, so that the depreciation allowed should be between ten and sixteen per cent. A maintenance figure of three and one-half per cent. per year is small for the part of the American Bell Telephone Company. Interest, insurance and taxes will probably cost eight and one-half per cent. more. Taking an average rate of twelve per cent. for depreciation, making due allowance for the scrap value, and allowing eight and one-half per cent. for interest, insurance and taxes (of which two and one-half per cent. is allowed for the latter two items), and three and one-half per cent. for maintenance, makes a total annual item of cost to the American Bell Telephone Company for furnishing these pieces of apparatus to the Chicago Telephone Company that amounts to twenty-four per cent. of their first value of three dollars per

set. As the Chicago Telephone Company, in the Chicago business, has now (January 1, 1907) more than 131,000 telephones in actual use, we assume that our estimate of an average of 150,000 complete telephone sets in use and in stock during 1906, is approximately correct, though we have not had time to verify this figure. At three dollars per set, the total value of these 150,000 sets is $450,000.00, and twenty-four per cent. of this amount is $108,000.00, which is a fair payment to the American Bell Telephone Company for furnishing these instruments. This leaves a balance of approximately $174,000.00 in the license account.

The Chicago Telephone Company urges that they get the value of this sum through the engineering work which is done for them by the American Bell Telephone Company and the American Telephone & Telegraph Company, which is an offshoot of the American Bell Telephone Company, and also through the associations with the other great Bell telephone operating companies, and especially the companies at New York, Boston and Philadelphia, from whom they are at liberty to ask for information through their Bell Telephone Company relations. The company's engineers report that they receive working specifications for switchboard installations, line and conduit work, pole line construction, cable construction, building materials, etc., etc., of which several hundred specifications are now on file, and others are being furnished from time to time; and bulletins are supplied, treating of engineering practice and operating methods which summarize the experience and practice of the various large Bell telephone companies. Special studies of the best methods of operating are carried on whenever the occasion arises, by the engineers of the American Bell Telephone Company, and that company maintains a well equipped laboratory in Boston, wherein tests and investigations are carried on for the benefit of the local companies. All of which service is rendered without direct expense to the Chicago Telephone Company, and paid for through this so-called royalty account.

It is also urged that a portion of this payment is justified on account of the exclusive license to use, in Chicago, apparatus coming within the patents of the American Bell Telephone Company and its off-shoots. The most important of such patents which are now in force is probably the Pupin patent for improving telephonic transmission by the use of what are called "loading coils," and we believe that this is of material financial value to the Chicago Telephone Company by enabling that company to reduce the cost of the copper wire in its cables and especially in its trunk conductors which lead from each exchange to the other exchanges.

In our opinion the advantages derived from this contract by the Chicago Telephone Company are worth a very considerable sum of money. We are not prepared to make an exact estimate of its value without time for additional investigation.

Under the terms of the contract, the company is permitted to carry on hand,

without extra charge, an additional number of telephone instruments equal to three per cent. of the total number of instruments in service, but all additional telephones carried in stock in excess of the three per cent. must be paid for at the rate of 81 cents per set per year. The company's business is growing at the rate of over 20,000 telephones per year, and the three per cent. does not permit it to keep on hand enough instruments to carry on the business without paying royalties on telephones from which no revenue is received. This rate of growth and the other exigencies of the business require the company to keep on hand additional instruments equalling in number about ten per cent. of the number of instruments in use, and we believe that these should be supplied under the contract without the extra charge.

Consideration of the contract with the Western Electric Company is a delicate question, because we understand that the American Bell Telephone Company owns a controlling interest in both the Chicago Telephone Company and the Western Electric Company. We have therefore scrutinized the contract between the Chicago Telephone Company and the Western Electric Company with much care. This is a contract which makes the Western Electric Company the purchasing agent for the Chicago Telephone Company under certain conditions which seem to us to be reasonable and to the advantage of the Chicago Telephone Company. The Western Electric Company is a large manufacturer of electrical apparatus, and therefore a large user for itself of copper wire and of other materials needed by the Chicago Telephone Company, which makes it a purchaser that is able to gain the best market prices for large purchases.

The Western Electric Company is also the purchasing agent of other Bell telephone operating companies, which farther improves its opportunity for purchasing at low figures. The contract between the Chicago Telephone Company and the Western Electric Company may be terminated by either party upon three month's notice given in writing. The telephone company is privileged to purchase of other parties any materials that can be purchased for less money direct than through the Western Electric Company. The Western Electric Company is under obligation to sell any of its manufactured products to the telephone company for not exceeding the price at which similar products could be bought elsewhere, and at a price not exceeding that at which it sells to any other purchaser. The Western Electric Company receives two per cent. commission for handling the general supplies furnished to the telephone company which the Western Electric Company does not manufacture, but this commission is only paid to it on the condition that the total price to the Chicago Telephone Company, with the two per cent. commission added, shall not exceed the price the telephone company would pay if it purchased its supplies at the most favorable figures in the open market. The telephone company has the privilege of buying a special list of apparatus and supplies anywhere at its pleasure, and this list of appara-

tus and supplies may be changed by adding thereto or deducting therefrom at the pleasure of the telephone company.

This contract appears to us favorable to the telephone company, and it is in such form that it gives the telephone company the privilege of purchasing in the lowest market in case the Western Electric Company fails to meet the prices of other vendors.

It is our opinion that the aforesaid two contracts which the Chicago Telephone Company has heretofore made respectively with the American Bell Telephone Company and the Western Electric Company are not harmful, but enable the Chicago Telephone Company to improve its service and purchase its supplies at a less expense than it otherwise could.

In the report of the City Auditor on audit of Chicago Telephone Company's books for the year 1905, there are in exhibit "K" certain items which caused some question in the meetings of the Committee; these are as follows:

1. "Thirty-five items of expenditures charged to 'Operating and Maintenance,' questioned by the auditors, for which the Telephone Company refused to furnish any data supporting same, total $269,884.66."

We understand that these items have since been audited and classified by the City Auditor and made the subject of a supplemental report to your Committee.

2. "Reserve for 'Insurance,' set up from one year's profits, $150,000."

This seems to be a reasonable appropriation for starting an insurance fund for the purpose of enabling the Company to carry its own insurance on its switchboards and other parts of the plant which fire insurance companies refuse to underwrite at reasonable rates. A smaller amount should be set aside in succeeding years after the fund is properly established. We have covered the object of this reserve as one of the purposes of a depreciation and insurance fund which is described later in this report, and which, if adopted, will take the place of this and other reserves in the affairs of whatever company is granted a franchise.

3. "Exchange Royalty or Rentals paid American Bell Telephone Company for rental of parts of phones $305,000."

This item we have treated above.

4. "Reserve for litigation set up from profits of 1905, $275,000,"

The Chicago Telephone Company has been involved in expensive litigation since 1901 regarding the validity of their charge of $175.00 per year for metallic circuit telephone service, and since January, 1905, regarding the amount of compensation which should be paid to the City under the terms of their present franchise. The questions involved in both these cases were decid-

ed unfavorably to the company in February, 1906, and since that time the company has paid to the City $260,000 on account of back compensation due. In addition to this payment to the City, the company's auditor advises us that during the year 1906 they refunded to subscribers $85,129.33, the same being the amount due them on account of overcharges collected for metallic circuit service. The amount of this payment we have not verified.

The appropriate amount to have been set aside for this fund during 1905, and charged against the earnings of that year, should have been the amount which the City was entitled to as compensation on business done in annexed territory plus the total amount which the company collected in excess of $125.00 from each metallic circuit subscriber, and which it was not entitled to and later had to refund. A determination of this amount is more a question of auditing than a technical one, and, as it is wholly a matter in the past, we have not considered it our duty to make a further examination into it without receiving specific instructions from your Committee.

We have carefully scrutinized the proposed franchise of the Chicago Telephone Company as printed in a pamphlet which was prepared for distribution through your Committee, and we have conferred with Mr. Maclay Hoyne, special counsel of the Committee, in regard to the same.

Section 2 of the proposed franchise as printed does not appear to us to be satisfactory, and should be altered to afford the City Comptroller the right to examine all original papers, vouchers and items of earnings and receipts, in addition to the ultimate records and books of account, and it should require the company to keep one set of records and books of account for its business done in the city of Chicago and another set for its business done outside thereof. The City Comptroller should have access to both of these sets of books, records, vouchers and other original papers. The records and accounts of the company relating to traffic and business done inside the city should be required to be kept in a manner satisfactory to the Comptroller. The latter requirement is for the purpose of insuring that the records and accounts shall be kept in a manner to afford data for determining the relative costs of the different classes of service, with the object of bringing about an improved classification of service and to give the City Council suitable information for consideration in connection with their privilege of regulating rates.

This section should also be made specific in showing what is to be comprised within the gross receipts upon which the City's compensation of three per cent. is to be paid. We understand that your Committee has decided as a matter of policy that the compensation shall be paid not only on the receipts collected for local messages and equipment within the city, but also such money as is paid to the Chicago Telephone Company by the long-distance company (The American Telephone & Telegraph Company) for messages

delivered to the said company's lines for long-distance transmission, and all receipts for other toll messages. Mr. Bloyne has modified the section with this in view.

The contract with the American Telephone & Telegraph Company gives the Chicago Telephone Company twelve cents for each outgoing message as a commission for handling both outgoing and incoming messages, no specific payment being made on incoming messages. This seems like a fair remuneration for the service, and is similar in amount to the commissions for such service paid elsewhere in Bell and Independent circles. At the most, it aggregates less than one per cent. of the total income derived by the company from its city business.

The last item mentioned above, namely, the toll business from Chicago to points outside of the city limits done by the Chicago Telephone Company over its own lines or its own lines in association with those of the Central Union Telephone Company in Illinois and Indiana and the Wisconsin Telephone Company in Wisconsin, amounts to a much larger sum. During December, 1906, there were 112,772 outgoing messages handled in this service solely over lines of the Chicago Telephone Company, bringing a revenue of $23,370.95 for the month, according to the books of the company; besides which there were 7,495 messages from Chicago to points in the Central Union territory, affording total receipts of $3,323.20, of which $2,677.22 belongs in the gross receipts of the Chicago Telephone Company, and there were 2,889 messages from Chicago to points in the Wisconsin Telephone Company's territory, bringing the total sum of $1,183.90, of which $1,072.23 belongs in the gross receipts of the Chicago Telephone Company. This gives a gross revenue to the Chicago Telephone Company from the aforesaid toll connections of $27,119.40 for the month of December, 1906. The statement of the toll business of the Chicago Telephone Company for December, 1906, shows that 49.6 per cent of this sum was earned on account of mileage within the city of Chicago. This is so near 50 per cent that we feel justified in recommending that the ordinary toll service of the company, aside from that going to the long-distance company (American Telephone & Telegraph Company), shall be considered as having an earning capacity of 50 per cent within Chicago and 50 per cent outside of Chicago. It is reasonably fair to assume that as much traffic comes into the city as goes out over the toll lines. Upon these assumptions, it is proper that the three per cent. compensation (if applied at all to the service to exterior points) shall apply to all of the receipts of the Chicago Telephone Company for toll business originating in Chicago, except as described for the long-distance company. This arrangement, it will be noted, makes it unnecessary in the accounting with the city to enter upon any consideration of incoming toll messages, because the receipts of the Chicago Telephone Company for the ordinary outgoing toll messages aggregate substantially an amount which wil

account for both outgoing and incoming toll messages when prorated according to the proportion earned within the city of Chicago.

We here give a portion of this section of the proposed franchise as recast by Mr. Hoyne to include the features which we recommend.

> SECTION .—During the term of this grant the Chicago Telephone Company shall, at all times, keep at the principal office of the company, in the City of Chicago, all its records, books, accounts, contracts and vouchers of receipts and expenditures, and a complete and separate set of accounts, books, records and vouchers showing, in detail, all the investments, expenses, receipts and earnings of its Chicago or local business. The said set of accounts, books, records and vouchers, relating to the Chicago or local business of said Chicago Telephone Company, shall be kept in a form and manner satisfactory to the comptroller of the City of Chicago. The City of Chicago, by its comptroller or any person designated by him in writing, shall have and may exercise the right at any time or times during business hours, to make a complete examination of all said records, books, accounts, contracts and vouchers for the purpose of verifying any of the statements of gross receipts herein provided for, and for any other purpose whatsoever connected with the duties or privileges of the city or company under this ordinance, and may audit the same at or about the end of each year. The said Chicago Telephone Company shall file with the comptroller of the city, within thirty (30) days after the first days of January and July in each and every year, an itemized statement of all its gross receipts from all of the business done by said company within the City of Chicago for the six (6) months next preceding said first days of January and July, which statement shall be sworn to by the president and secretary of said company, and at the time of filing said statement the company shall pay into the city treasury three per cent. (3%) on all such gross receipts. All moneys received by said Chicago Telephone Company for telephone service, communication and messages from the exchanges, offices, stations or telephones of the said company, or of its lessees, subscribers or patrons, located within the City of Chicago, to any exchanges, offices, stations or telephones now or hereafter owned or operated or leased by or to said company outside the City of Chicago (commonly known and designated as "toll" service, communication or messages), together with all moneys received by said Chicago Telephone Company, or which it is entitled to receive, as its share of the gross receipts from other telephone service, communication and messages between the exchanges, offices, stations or telephones of the said Company, or of its lessees, subscribers or patrons located within the City of Chicago, and any exchanges, offices, stations or telephones of any other company or person outside said City of Chicago (commonly known and designated as "long distance" service, communication or messages), shall, for all the purposes of this ordinance, and particularly for the purpose of computing the compensation semi-annually due the City of Chicago hereunder, be deemed and treated as a part of the gross receipts from the telephone business done by said Chicago Telephone Company within the

City of Chicago, and the business hereinabove described, from which any or all of the said moneys are derived, shall be deemed and treated, for all the purposes of this ordinance, as local business. Provided, that the share of the gross receipts from long distance service, communications and messages of the Chicago Telephone Company, which said Chicago Telephone Company is hereby obligated to include in its computation of compensation due to the City of Chicago, shall be computed for the purposes of this ordinance by allowing to, and charging against, said Chicago Telephone Company at least twelve cents for each and every outgoing long distance message from any exchange, office, station or telephone of said Chicago Telephone Company, or of its lessees, subscribers or patrons located within the City of Chicago. Provided, also, that the first statement of gross receipts filed hereunder shall cover the period from the date this ordinance goes into effect until the first day of the next following July or January, as the case may be.

* * * * * * * * * * * * *

In conference with Mr. Hoyne we have proposed extended changes in the section of the printed proposed franchise which relates to rates. We have made an industrious effort to gather data relating to the cost to the telephone company for the average completed message in each class of service, but have been unable to derive the information from the records which the company keeps, on account of the fact that their traffic records are not kept in sufficient detail and their books of account are not kept in such a manner as to separately show the receipts and expenses relating to the several classes of traffic. We have endeavored also to get information bearing upon this question through the Chicago Telephone Company from other Bell telephone companies, but without success; and we have also endeavored to get information bearing upon the question from certain of the larger Independent telephone operating companies, but likewise without success. None of the telephone companies seem yet to have reached a point in their development where their records are kept with a view toward determining the cost of each class of service and the most economical way of providing for the requirements of each class of service. The telephone art has progressed at such a tremendous pace and the companies have been so busily occupied in developing their business and improving their methods considered as a whole, that they have not yet come to carefully study the different classes of service considered in detail. We have recommended that the books of the company to which a franchise is granted shall be kept in a manner satisfactory to the City Comptroller, in order that he may require the records to be kept in such form that the Council may in the future have information as extended as practicable in regard to the costs of different classes of service upon which to base any future regulation of rates which the Council may desire to make.

As we have been unable to gain actual data upon which to found an estimate of the cost of service in each class, our data applying only to the aver-

ge cost of service and not to the individual classes, we recommend the llowing schedule of rates as the maximum which may be charged by any lephone company to which a franchise is granted; and we couple this with ie recommendation, hereinafter fully explained, that either a suitable nitation be placed on the company's net earnings which will automatically sult in the gradual reduction of rates, or else that a contract right to regulate tes be reserved to the City. It is our opinion that the schedule given below ill result in an immediate reduction in the average prices paid for telephone rvice but still leave the company a reasonable return on the investment hen the rates are fully in effect.

SECTION .—The company shall at all times maintain its plant, wires, cables, electrical conductors, and other equipment at the highest practicable efficiency, and to that end shall promptly adopt and put into use within the City of Chicago all improved apparatus, appliances, equipment and methods of service developed in the progress of the art of telephony which shall have come into common use from time to time if experience has shown them to be practicable and shall furnish the same to its lessees, subscribers and patrons within said City of Chicago without extra charge therefor.

Said Chicago Telephone Company during the term of this ordinance shall not charge its present or future lessees, subscribers or patrons within the City of Chicago rates for telephone service in excess of the following maximum rates and shall furnish all kinds of telephone service it supplies promptly on demand.

(*a*) Maximum rates for telephone service furnished for the use of subscribers and their employes in their business.

For a single party line including three hundred outgoing conversations or messages from said line and all incoming conversations or messages, $15.00 for each quarterly period of three months.

For the next six hundred outgoing conversations or messages during the quarter, 3 cents each.

For all additional outgoing conversations or messages during the quarter, 2 cents each.

Every subscriber who will contract to use or pay for eighteen hundred outgoing conversations or messages during the quarter at the above rates per message, shall be furnished with a second single party line without extra charge, and every subscriber shall be furnished with an additional single party line without extra charge for each additional fifteen hundred outgoing conversations or messages he will contract to use or pay for during the quarter at the rate of 2 cents each.

Every subscriber also shall be furnished with as many single party lines as he may demand in addition to the first party line he contracts for, without contracting to use or pay for any particular number of outgoing conversations or messages per quarter, at the rate of six dollars per quarter for each line.

Every subscriber who is furnished with single party lines in addition to his first line under the above mentioned quarterly guarantees or

at the above mentioned rate may use each or any or all of his lines wholly for incoming messages or wholly for outgoing messages or for both, as he may elect.

A single party line including the right to transmit outgoing conversations or messages without limit and without any charge per conversation or message, shall be furnished at the rate of One Dollar per day. Every subscriber to such a line as that just mentioned, shall be furnished with an additional single party line, during any quarter without extra charge for each 1,500 outgoing conversations or messages he will contract to use or pay for during the quarter, at the rate of two cents for each message.

Subscribers or lessees contracting for two or more single party lines when said lines are contracted for at the same premises shall be furnished, if they desire, without additional charge, private branch exchange switching apparatus, appliances and equipment including an operator's telephone, but a charge of $1.50 per quarter may be made for each terminal telephone connected with the private branch exchange switching apparatus upon the same premises.

In computing the amount due to the Company from any subscriber for the total number of outgoing conversations or messages transmitted during any quarter at message rates, by means of more than one single party line, the same rates per message shall be charged in such computation as would be charged if said total number of outgoing messages had been transmitted over one single party line. The Chicago Telephone Company shall make no charge to any subscriber for any incoming conversation or message transmitted over any line furnished at any of the rates herein mentioned. All such conversations or messages shall be regarded and treated as prepaid.

(*b*) Maximum rates for telephone service furnished for the use of subscribers at their private residences.

For a single line including all incoming and outgoing conversations or messages, $18.00 per quarter.

For a two party line including also all conversations or messages, $15.00 per quarter.

For a three-party line including also all conversations or messages, $12.75 per quarter.

(*c*) Nickel prepayment service shall be furnished by said Chicago Telephone Company upon demand, by means of telephone instruments equipped with a coin box and slot or similar device for receiving five cent pieces, without charge for incoming conversations or messages, and upon guarantees not in excess of the following rates:

NICKEL PREPAYMENT SERVICE, with outgoing messages at 5 cents each, as follows:

One-party line at a guarantee of 20 cents per day, including four messages.

Two-party line at a guarantee of 15 cents per day, including three messages.

Two-party line (for private residences only) at a guarantee of 10 cents per day, including two messages.

Four-party line (for private residences only) at a guarantee of 5 cents per day, including one message.

When any lessee or subscriber in making settlement with said Chicago Telephone Company at the time of collection under the guarantees above mentioned, shall pay any amount to make up a deficiency between the amount in the coin box or similar device used and the sum guaranteed, he shall be given at the time of making such deficiency payment a receipt or some written or printed evidence showing the amount and date of such deficiency payment. Any payments made subsequently for service in excess of the amount guaranteed up to the time of any succeeding collection (made not less than fifty days after said payment of a deficiency) shall be repaid to said subscriber or lessee wholly or in part, as may be necessary to equal the amount paid by him to make up such deficiency.

The said Chicago Telephone Company is hereby expressly forbidden to furnish telephone service to more than four subscribers, lessees or patrons by means of a single circuit or line.

Said Chicago Telephone Company shall be obliged to furnish four-party line service only when at least two subscribers or lessees located within the limits of a single block desire such service.

(*d*) Public telephone service.

The charge for a single conversation or message from any telephone located within the City of Chicago to any other telephone within the city shall not exceed 5 cents. Any charge in excess thereof shall be unlawful. Said Chicago Telephone Company is hereby expressly forbidden to authorize or permit any of its lessees, subscribers or patrons to whom it has furnished or hereafter furnishes a telephone instrument or instruments, line or lines, to charge any person more than the rate above prescribed without regard to how or where such telephone instrument or instruments, line or lines, may be installed.

If said Chicago Telephone Company shall become aware that any of its subscribers or lessees within the City of Chicago, is charging more than five cents for a single conversation or message, it shall notify the guilty subscriber or lessee, that upon the repetition of the offense he will be denied telephone facilities and service, and upon evidence being submitted to said Chicago Telephone Company that the subscriber or lessee so notified has subsequently made or permitted to be made an excessive charge for a single conversation or message, the company shall remove its telephone lines and instruments from the premises of said subscriber, and deny him telephone facilities or service for not more than one year nor less than three months as it may elect. Said Chicago Telephone Company is also forbidden to authorize or permit any of its subscribers or lessees to make any charge for any telephone communication, facilities or service in excess of, or in addition to the rates prescribed in this ordinance and shall take steps to prevent excessive charges of any kind by giving notice substantially as indicated above, and by the enforcement of the penalty mentioned.

(*e*) Neighborhood exchange service.

In addition to the Chicago Exchange System, extending throughout the City Limits, local or neighborhood exchanges within those limits may be maintained or established by the Company; but any subscriber therein may communicate with any telephone anywhere within

the City Limits outside of the local or neighborhood exchange by a message, for which a charge of not more than five cents may be made.

The rates for such local or neighborhood exchange service, under yearly contracts, shall not exceed the following:

	BUSINESS	RESIDENCE
One-party Line.....	$4.00 per month	$3.00 per month
Two-party Line.....	3.00 per month	2.00 per month
Four-party Line.....	2.00 per month	1.50 per month

But said Chicago Telephone Company shall not make, impose or collect any extra charge, rate, price or toll for any communication from any telephone within the City of Chicago, not served by one of said neighborhood or local exchanges, to any other telephone located within the City of Chicago; and said Chicago Telephone Company shall not make, impose or collect any extra charge, rate, price or toll for any communication from any telephone served by one of said neighborhood exchanges to any other telephone whatsoever located within the area or district lying within the boundaries or limits of said neighborhood exchange and served by any of the exchanges of said Chicago Telephone Company located within the City of Chicago.

(*f*) Toll service.

Said Chicago Telephone Company shall not charge more than ten cents for each conversation or message transmitted from any telephone located within the City of Chicago to any other telephone which is located outside the City of Chicago, but within fifteen (15) miles of the present City Hall in said City of Chicago, or within one mile of the City Limits and within the State of Illinois.

The Chicago Telephone Company may reasonably limit the length of each toll conversation or message transmitted from the City of Chicago to any point outside the City to not less than two minutes with the right to charge not more than five cents for each additional minute which the transmission of such toll conversation or message occupies.

(*g*) Unlimited telephone service—Meters.

The Chicago Telephone Company shall upon demand furnish unlimited telephone service for business use by means of single party lines to any person, firm or corporation at any point within the City of Chicago at an annual charge of not exceeding $125.00 for each line required instead of furnishing service at message rates within the maximum schedule of rates hereinabove prescribed unless and until it is able and ready to install in connection with his, their or its telephone line or lines a meter, register or similar device which can count or record each message or conversation transmitted therefrom only once and can make no count or record unless a connection for a conversation or message has been actually made.

The Chicago Telephone Company shall not make any charge to its telephone lessees, subscribers, patrons or users unless a conversation or message has been actually transmitted, except in any cases herein expressly provided.

(*h*) Extension telephones.

Said Chicago Telephone Company shall furnish to any of its lessees or subscribers upon demand at least two extension telephones for each line used by the lessee or subscriber and located in the same premises with the principal telephone of the lessee or subscriber at not exceeding fifty cents (50c.) per month for each extension telephone, provided that the Company shall not be compelled to furnish extension telephones to lessees or subscribers served by three or four-party lines.

(*i*) Telephone directory.

The Chicago Telephone Company shall at least three times during each year print and publish and furnish to each of its lessees and subscribers free of charge a directory containing in alphabetical order the names, with addresses and telephone numbers of all its lessees and subscribers. Said Chicago Telephone Company shall include and list in each of the said directories at the request or with the consent of any of its lessees or subscribers in connection with the address and telephone number of such lessee or subscriber in their proper alphabetical order free of charge the names of not more than three partners, officers, employes or members of the family of such lessee or subscriber for each single or two-party line contracted for by such lessee or subscriber, and make one such free listing for each three-party and four-party line, and also one more of such names for each extension telephone used by the said lessee or subscriber, and in addition thereto as many more of said names as said lessee or subscriber may request or consent to upon payment to the Chicago Telephone Company of not more than $3.00 per annum for each additional name so included and listed.

(*j*) Rates defined—Equipment charges.

All rates, prices or charges for telephone service, facilities or equipment herein prescribed are maximum rates only, and nothing herein shall be construed as an admission by the City of Chicago, that such maximum rates are reasonable or proper rates.

Said Chicago Telephone Company is hereby expressly forbidden to make any charges for any telephone apparatus, appliance, device or equipment not specifically mentioned herein, and for which some maximum rate is not prescribed herein.

It is our opinion that the monthly charge to be made for extension telephones on flat rate lines should be higher than for that made for extension telephones on measured rate lines, because with the flat rate lines no charge is made for the individual messages, and an additional monthly charge for extension telephones may be considered as corresponding to the charge per message for those messages originating in extension telephones attached to measured rate lines.

Mr. Hoyne feels that some difficulty exists in respect to making such a difference in the monthly charge by ordinance and we therefore concur in the above section as drawn.

We recommend that the company shall be required to keep its plant at the highest practicable efficiency and promptly adopt improvements arising

in the course of the development of the art of telephony which come into common use, and that the company shall furnish to the subscribers in any portion of the city of Chicago telephone facilities under yearly contracts and shall do this without discrimination as between classes of service. We also recommend that the company be required to abolish its ten-party line service, and in no instance place more than four parties on a line where rental is paid for telephones.

We consider the schedule of rates recommended by us a tentative schedule which is subject to regulation automatically by the limitation of net earnings or by the action of the City Council from time to time after two years when information in regard to its operation may be laid before the Council. We have made the schedule upon the basis that five cents shall be the maximum charge per message and that the price per message shall be steadily decreased after a reasonable use of any particular telephone has been reached. We have added to the Chicago Telephone Company's list of classes an additional class which comprises three-party residence flat rate telephones at $51.00 per annum.

A message is defined to mean a communication or conversation between two subscribers' telephone stations anywhere within the Chicago city limits and it is provided that messages shall be without toll charge when extending between any telephones paying Chicago rates (whether message rates or flat rates) and also for messages from all telephones paying Chicago rates to all telephones in neighborhood exchanges. In case of any neighborhood exchange telephone the privilege of a flat rate conversation only holds in the individual neighborhood, and a toll of not exceeding five cents each may be charged for conversations from any neighborhood telephone to Chicago rate telephones or neighborhood telephones located in another neighborhood.

We recommend that the present charge of 10 cents for local messages from hotels, depots, restaurants and other public telephones be reduced to 5 cents for each message.

We recommend that the price of toll service to suburban points in Illinois within a radius of fifteen miles from the present City Hall or within one mile from the city limits shall not exceed ten cents for two minutes' conversation and five cents for each additional minute or fraction thereof.

In respect to the message rates, we recommend that it be required that the company shall use meters wherever the messages are counted and that these meters shall be arranged so that only a single registry can occur for a single message. In this way subscribers are protected against double registry for any message. The meters should also be arranged so that the registry can be made only after the plug has been inserted in the subscriber's switch on the switchboard or other suitable connection has been made for conversation.

It is also recommended that the guarantee sums required from subscribers using telephones provided with nickel boxes shall be settled for approximately quarterly, or the equivalent thereof. The company may collect the guarantee

from month to month but in this event it shall count the messages and settle by refund, if necessary, at the ends of periods not exceeding approximately three months duration. It is proposed to meet this requirement by having the Chicago Telephone Company issue to this class of subscribers credit slips at the time when collections are made, in case the amount paid for messages at the tariff price is not enough to meet the required guarantee. These credit slips shall indicate the amount paid by the subscribers to make up the guarantee over and above the price paid for the messages used, and shall be good to apply as payment on a corresponding number of messages, in excess of those paid for by the guarantee accruing during the next succeeding period of not less than fifty days.

Table No. 5 shows a comparison of various flat and measured rate charges made by the Bell telephone companies operating in New York, Philadelphia, St. Louis, Boston and Baltimore, as taken from the schedules of rates prepared for your committee by Chairman Linn H. Young, November, 1906, and the maximum charges allowed in the foregoing schedule for the same classes of service. We have included in the latter the flat rate for three-party line at fifty-one dollars per year, which we recommend.

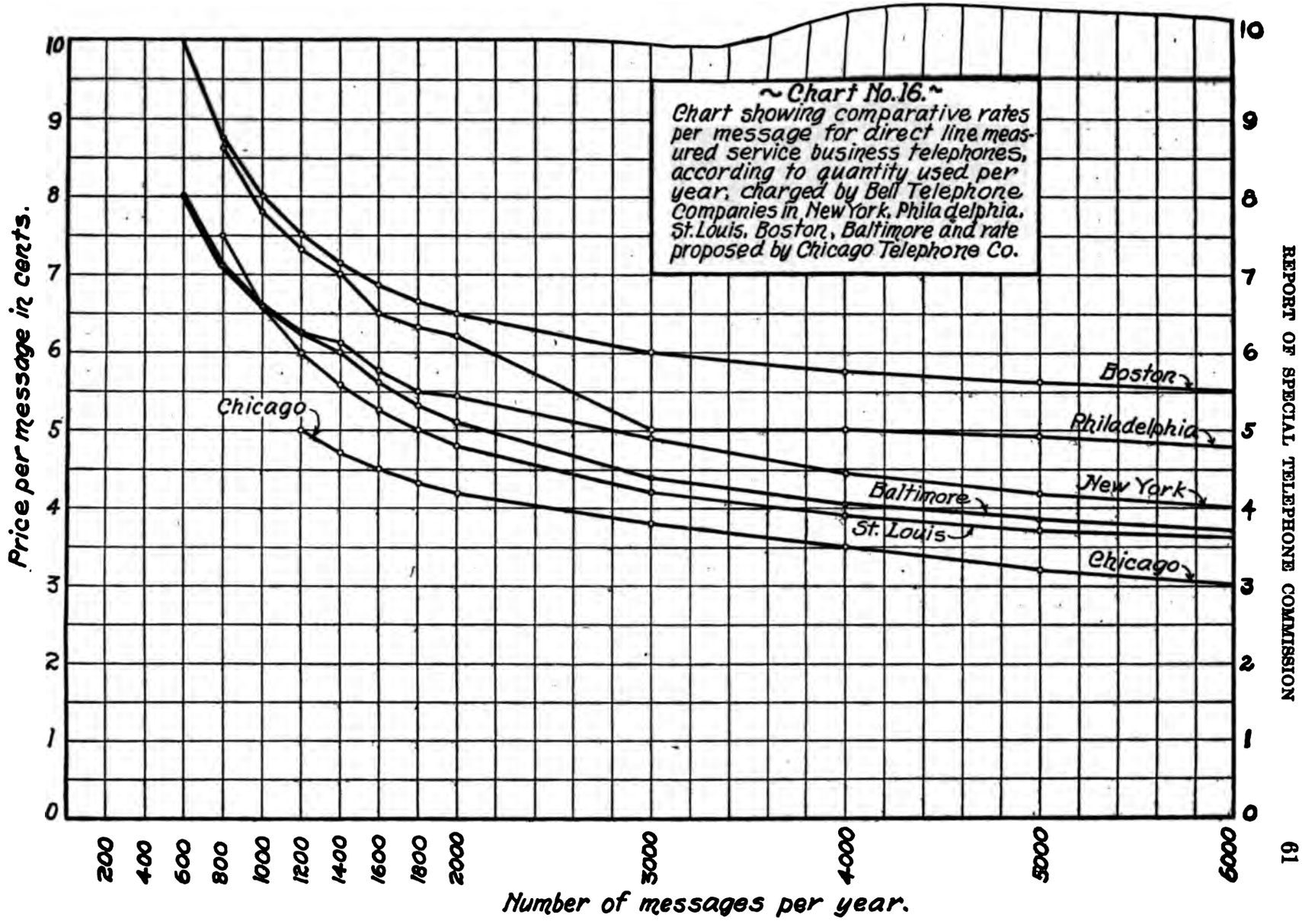
If in Chicago the direct-line sixty-dollar measured rate telephone is subscribed for by a person who requires less than twelve hundred outgoing messages per year, the cost to him per message will exceed five cents, but it is not contemplated that this class of service will be subscribed for by persons whose requirements are below twelve hundred outgoing messages per year, as they will probably take some form of nickel prepayment service, in which they can obtain their service at a rate not exceeding five cents per message.

Chart No. 16 shows comparative rates per message for direct-line measured service business telephones, according to quantity used per year, platted from the above table.

TABLE NO. 5.

	CHICAGO		NEW YORK		PHILADELPHIA		ST. LOUIS		BOSTON		BALTIMORE	
	Rate per Year Dollars	Rate per Message Cents	Rate per Year Dollars	Rate per Message Cents	Rate per Year Dollars	Rate per Message Cents	Rate per Year Dollars	Rate per Message Cents	Rate per Year Dollars	Rate per Message Cents	Rate per Year Dollars	Rate per Message Cents
Business flat rate	*a* 365	.....	None	.....	*b* 160	.....	125	.....	162	.....	*b* 125	.....
Direct Line, Measured—												
600 messages	.....	.....	48	8.00	.....	.....	.....	.....	60	10.00	48	8.00
800 messages	.....	.....	57	7.12	69	8.62	60	7.50	70	8.75	57	7.12
1,000 messages	.....	.....	66	6.60	78	7.80	66	6.60	80	8.00	66	6.60
1,200 messages	60	5.00	75	6.25	88	7.33	72	6.00	90	7.50	75	6.25
1,400 messages	66	4.71	85	6.07	98	7.00	78	5.57	100	7.14	84	6.00
1,600 messages	72	4.50	92	5.75	105	6.56	84	5.25	110	6.87	90	5.62
1,800 messages	78	4.33	99	5.50	114	6.33	90	5.00	120	6.66	96	5.33
2,000 messages	84	4.20	109	5.45	124	6.20	96	4.80	130	6.50	102	5.10
3,000 messages	114	3.80	147	4.90	150	5.00	126	4.20	180	6.00	132	4.40
4,000 messages	140	3.50	178	4.45	200	5.00	156	3.90	230	5.75	162	4.05
5,000 messages	160	3.20	209	4.18	246	4.92	186	3.72	280	5.60	192	3.84
6,000 messages	180	3.00	240	4.00	286	4.77	216	3.60	330	5.50	222	3.70
Residence—												
Flat rate, Direct Line	72	.....	None	.....	Zone rate only.		60	.....	116	.....	48	.....
Flat Rate, 2-Party Line	60	.....	None	.....	" "		42	.....	90	.....	36	.....
Flat Rate, 3-Party Line	51	.....	None	.....	None	.....	None	.....	None	.....	None	.....
Flat Rate, 4-Party Line	None	.....	None	.....	Zone rate only.		36	.....	None	.....	None	.....
Measured Service—												
Single Line, minimum charge	60	5.00	48	8.00	60	7.50	48	4.80	60	10.00	48	8.00
Additional messages, each	.....	3.00	.....	5.00	.....	5.00	.....	3.00	.....	5.00	.....	5.00
2-Party Line, minimum charge	36.50	5.00	42	7.00	33	8.25	36	4.50	45	9.00	30	8.33
Additional messages, each	.....	5.00	.....	5.00	.....	5.00	.....	3.00	.....	5.00	.....	5.00
4-Party Line, minimum charge	18.25	5.00	36	6.00	None	.....	None	.....	None	.....	36	6.00
Additional messages, each	.....	5.00	.....	5.00	.....	.....	.....	.....	.....	.....	.....	5.00

a—For private branch exchange trunk lines.


~Chart No.16.~
Chart showing comparative rates per message for direct line measured service business telephones, according to quantity used per year; charged by Bell Telephone Companies in New York, Philadelphia, St. Louis, Boston, Baltimore and rate proposed by Chicago Telephone Co.
Price per message in cents.
Number of messages per year.
Boston
Philadelphia
New York
Baltimore
St. Louis
Chicago
Chicago
0
1
2
3
4
5
6
7
8
9
10
200
400
600
800
1000
1200
1400
1600
1800
2000
3000
4000
5000
6000

Applying the above proposed rates to the present telephones of the Chicago Telephone Company in the City of Chicago, we estimate that it will require the expenditure of approximately $1,500,000, which is chargeable to construction account, to prepare the present plant for the purpose of properly furnishing the service under the conditions set up by the foregoing proposed schedule of rates. This sum includes allowances for the purchase and installation of meters, the changing of switchboards and subscribers' instruments and the addition of circuits demanded by changing the ten-party lines to four-party lines, additional underground conduits and cables to fulfill the requirements of the proposed underground limits, and additional trunk conductors to carry the extra traffic which may be reasonably expected to arise from the reduction of the toll rates from neighborhood exchanges.

This brings the book value of plant investment account within the city (excluding cash for working capital), to approximately $16,130,000. We estimate that the present telephones (132,000) will earn $6,336,000 per year, and that the gross expense, including compensation to the city, but excluding an appropriation to a depreciation and insurance fund, will be $4,092,000 per year. This leaves a difference of $2,244,000 which may be applied to the payment of dividends and the depreciation and insurance fund. This amount is sufficient to permit the company to pay a dividend of 7 per cent. on its investment including a fair allowance for working capital, and to set aside $1,097,400 to the fund for depreciation and insurance, and is less than the return, which in our opinion is reasonable, as pointed out in the last paragraph on page 63 and the first paragraph on page 64 of this report.

We estimate that these figures are fairly applicable to conditions that would exist during the next two years, while the necessary changes are being made, in case the Chicago Telephone Company should receive a franchise; but after that time, as the plant increases, the average cost of producing the service will decrease per telephone with good management, and the charges for service should also ultimately decrease.

We estimate that the proposed new rates are low enough to at once reduce the gross receipts per telephone in comparison with the gross receipts obtained per telephone by the Chicago Telephone Company under its existing rates. The rates are also planned with a particular view to bringing about the best practicable service to all users.

At the present time the service in Chicago is impaired, as we have earlier pointed out, by the over use of the flat rate lines. Investigation shows that during the past two years the flat rate lines, including the flat rate trunk lines to private branch exchanges, originate approximately 60 per cent. of the total traffic in the Chicago exchange district; whereas the total amount paid for the use of these lines is only approximately 42 per cent. of the amount collected by the Chicago Telephone Company for exchange service in the same district. This indicates that the flat rate subscribers, as a class, are getting relatively more for their money than the measured rate subscribers,

even taking into consideration the fact that the large user should, on account of his large use, receive his service at a smaller unit cost than the small user. The above being true for the average flat rate subscriber, we must conclude that the flat rate subscriber, whose use of the telephone is above the average of his class, is receiving relatively much more service than the amount he pays entitles him to.

These estimates of receipts and net earnings on the new rates are made without consideration of the effect of competition; but if extensive telephone competition is established, especially with the competing prices consisting of comparatively low flat rates, the earnings indicated by our estimates would be reduced in a degree which it is impossible to estimate with reasonable accuracy.

The question of regulation of rates has caused us a great deal of difficulty. We have discussed four means which substantially amount to regulation, by the City, of the rates for telephone service.

1. The first involves the reservation by contract of a simple right of regulation at certain intervals by the City Council, naming the intervals preferably as two years after the acceptance of the franchise and at the end of five year periods thereafter. This is simple and ought to prove effective, if the law department approves the plan as coming within the powers of the City, and the Comptroller appropriately requires the company to make its accounting so as to lay the necessary information in regard to the cost of service before the Council, but it leaves the door open for litigation regarding the reasonableness of any changes of rates which may in the future be required by ordinance.

2. The second method involves limiting the returns on the investment of the company to some suitable figure, over and above which all additional net earnings shall be paid to the City. This involves fixing by franchise the return on the investment which may be taken by the company. For a twenty year franchise such as your Committee proposes, without a guarantee of purchase by the City or other corporation or a guarantee of an extension to the franchise at the end of the period, the returns paid annually on the investment must be large enough to include (1) ordinary interest on money, and (2) an appropriate amount to meet the risk of business and serve in a sense as a sinking fund for the investors. Under the circumstances, it is our opinion that ten per cent. is a reasonably low figure. Limiting the annual return on investment to this figure would in a sense provide automatic regulation of rates, since the operating company would be likely to lower its rates from year to year and thus satisfy its customers, in case it made net earnings larger than ten per cent., in preference to paying sums of money into the City treasury, unless the City Council interfered. This process seems to us less likely to result in future litigation over rates than the first-named plan and therefore more desirable, provided Mr. Hoyne finds it practicable to draw a suitable form of ordinance grant. In our opinion, it would also place upon the company a greater incentive to maintain the best possible service at reasonable rates.

The adoption of this process makes it necessary to verify the amount of investment now in the plant within the city of Chicago, as the books do not separate the investment which has been made within the city of Chicago from that which has been made by the company outside of the city of Chicago; and it is also necessary to make provisions for setting aside a depreciation account to meet the requirements for the renewal of apparatus and plant. We have below set forth careful estimates of depreciation for your information, so that you may see the way in which we have arrived at the percentage. In our opinion, a reasonable percentage to set aside for a depreciation and insurance fund, to apply at the present era, is 8.0 per cent. of the value of the whole tangible property of the company, excluding land, stock of materials and cash on hand, but it is our further opinion that it is desirable to provide for a readjustment of this percentage at certain periods in the future, because the proportions of short lived and long lived plant may change with the advance of the art during the next few years. We believe that the depreciation rate is likely to decrease, but it is impossible to foresee what the future rate should be.

The fund to be set aside must include provision for replacing plant which has come to the end of its useful life on account of age or on account of advances of the art; it must also include provision for reconstruction of portions of the plant not yet ready for "scrapping" but which must be reconstructed on account of changes required by city improvements ordered by the City Council (these reconstruction expenditures are now included in maintenance by the Chicago Telephone Company); and it must include provision for fire insurance on those portions of the plant which the fire insurance companies will not underwrite at reasonable terms. An amount proportional to the value of the plant should be put into the fund each year, and the amount must be computed from experience of the average life of the different parts of the plant making due allowance for the "scrap" value of discarded apparatus or material, judgment of the rate at which street, bridge and park improvements are likely to be made which will interfere with the company's plant, and experience of the fire hazard. Disbursements from this fund should be allowed to occur only for the specific purposes to which the fund is allotted.

We have carefully studied this problem and have discussed it with the engineers of the Manufacturers' Telephone Company and the Chicago Telephone Company. The former (Mr. Johnston) submitted a brief table of depreciation with his revised estimate but did not include reconstruction or insurance. The figure as given by him averages just under six per cent. on the value of the plant per annum, without consideration of salvage or accretions to the fund by interest. When the latter are taken into account (interest at three per cent. per year), the average figure is reduced to 4.11 per cent. Mr. Johnston makes allowance for reconstruction in his expense estimate by setting up a special reserve of $390,000 per year.

The engineers of the Chicago Telephone Company at our suggestion went into an extended study of the depreciation of their plant, and have arrived at a figure of 6.8 per cent. each year for depreciation and 4.1 per cent. each year for reconstruction made necessary by city improvements, due account being taken by them of accretions to the fund by compound interest at three per cent. per year. This makes a total annual contribution to the fund of 10.9 per cent. of the cost of plant.

It is our opinion that the engineers of the Chicago Telephone Company have not given sufficient consideration to the improvement in conditions that now pertain to the telephone situation compared with the past, and that their percentages are too high; and as Mr. Johnston has confessedly not made allowance for the various contingencies that arise in the telephone art his depreciation percentage is too low. It is our opinion that 5.75 per cent. for depreciation and 2.25 per cent. for reconstruction and such insurance as comes within the scope of this fund are reasonable figures. This makes the total sum to be properly set aside each year for the depreciation and insurance fund as defined in an alternative franchise section printed below, equal to 8.0 per cent. of the value of the tangible property, excluding land, stock of materials and cash on hand. This percentage is named with due consideration of accretions to the fund by interest. The manner of maintaining the fund and the purposes of its expenditure are defined in the alternative franchise section printed below.

3. A third method of automatic rate regulation, corresponding somewhat to the preceding, consists in fixing a certain figure for the return on the investment, with the proviso that all net earnings beyond that amount shall be divided between the City and the company. The conditions in the telephone business, however, are so complex in respect to the different classes of customers that we do not recommend this for adoption in the telephone situation.

4. A fourth method involves limiting the return on the investment with the requirement that all excess net earnings shall be refunded or rebated pro rata to the subscribers at the end of the year. This is a form of profit sharing which is also too complex, in consideration of the conditions in the telephone business, to make it desirable, and we do not recommend it.

In consultation with Mr. Hoyne, your special counsel, we have arranged for drafting appropriate ordinance clauses which will cover respectively the first and second of these methods, and we here present them to you for your consideration. Mr. Hoyne will advise you in regard to their relative merits from the legal standpoint. We believe that either will give satisfaction to the city if adopted; and that either will bring about a gradual decrease in rates after two years from the acceptance of the new ordinance, in case it is granted to the Chicago Telephone Company so that experience may be gained in the application of the rates in the meantime.

The following is an ordinance section drawn by Mr. Hoyne to meet the requirements of the first method:

SECTION —. The City Council, as one of the conditions of the grant of the privileges herein conferred upon the Chicago Telephone Company, hereby reserves to itself the right to hereafter alter, change or reduce, from time to time by special ordinance amendatory hereof, the maximum rates for telephone service, facilities and equipment hereinbefore prescribed, and any rates or charges for such service, facilities or equipment which are now, or under this ordinance hereafter may be, prescribed, imposed or collected by said grantee, as the City Council may deem expedient and reasonable, and to pass, by special amendatory ordinance from time to time, all reasonable rules and regulations relative to the rates or charges for telephone service, facilities or equipment of said grantee.

The Chicago Telephone Company, by the filing of the acceptance of the terms and conditions of this ordinance hereinafter provided for, shall be understood as expressly consenting and agreeing to promptly accept, adopt, put into effect and operate its telephone system then in the City of Chicago, under any reasonable schedule or schedules of rates or charges for telephone service, instruments, facilities or equipment, or for all or any of them, or any reasonable schedule or schedules of limitations upon such rates or charges or any reasonable rules and regulations relating thereto which the City of Chicago may by such special ordinance prescribe from time to time after the expiration of two years from the time this ordinance goes into force and effect. Provided, that any schedule or schedules of rates or charges or of limitations thereupon which are prescribed as aforesaid shall not be fixed by the City of Chicago for a period of more than or of less than five years, unless at the time of the passage of the ordinance prescribing any such schedule or schedules the unexpired term of this grant is less than five years. Provided, also, that any ordinance passed under the foregoing provisions of this section shall not operate or be construed as changing any of the rights or duties of the City of Chicago or the Chicago Telephone Company under this ordinance except those covered by the parts of Section — hereof relating to the rates or charges of said Chicago Telephone Company for telephones, telephone service and equipment, and those rights or duties shall be changed only so far as they are inconsistent with the terms of any special ordinance so passed.

Nothing in this ordinance contained shall be construed or taken as preventing the City of Chicago, whenever it shall be empowered by the General Assembly so to do, from passing, from time totime, any general ordinance or ordinances regulating the rates, rentals or charges of telephone companies for telephone service, instruments, facilities, equipment or licensing, regulating or taxing telephone companies; it being the intention of this ordinance that the City of Chicago shall in no way surrender any right it may now have or may hereafter acquire to tax, license or regulate telephone companies, or to regulate the price, rates, rentals, charges or compensation to be charged for telephones, telephone service, facilities or equipment. Provided, also, that nothing in this ordinance contained shall be construed as preventing the City of Chicago from granting an ordinance to any other telephone company. The Chicago Telephone Company hereby agrees to comply with the terms of any reasonable

ordinance or ordinances passed as aforesaid. The Chicago Telephone Company by the acceptance of this ordinance shall be understood as agreeing to comply with the terms and conditions of any reasonable general ordinance or ordinances passed as aforesaid.

The following is an outline of an ordinance section to meet the requirements of the second method:

SECTION —. It is further understood and agreed that the company shall pay to the city each year all net earnings over and above ten per cent. on the average investment for that year. In determining the net earnings for the year, there shall first be paid out of the gross receipts of the company the sums necessary to pay the city its compensation of three per cent. upon the gross receipts and to pay for taxes, and such sums as are necessary to cover all reasonable expenses of operation, including general expenses, maintenance and repairs; and the company may, in addition thereto, set aside a reserve fund amounting to not more than eight per cent. of the average investment for the year, excepting land, stock of materials, and cash on hand, as a depreciation and insurance fund. The balance remaining of the gross receipts shall be accounted net earnings.

For the purpose of determining the average investment, as set forth above, the investment at or near the date of the acceptance of the terms of this ordinance by the company shall be ascertained by appraisal of the tangible property of the company within the City of Chicago, consisting of operating plant, real estate and buildings, * stock of materials on hand, teams, tools and other tangible property and working capital which shall not exceed at any time during the term of this ordinance ten per cent. of the tangible property exclusive of said working capital, this appraisal to be made in the manner hereinafter set forth. The average investment for the remainder of the then calendar year shall be computed by adding to the said appraised value of the tangible property of the company one-half the sum of additional money spent for additions to the company's tangible property within the said remainder of the calendar year, but no money taken from the depreciation and insurance fund hereinbefore provided for shall be included in the said sum so spent for such additions for the purposes of said computations.

The value of the plant at the opening of the ensuing calendar year shall be taken to be equal to the said appraised valuation, plus the whole of the said additional money so spent for additions to the company's tangible property. The average value of the investment for the said ensuing calendar year shall be obtained by taking this value found for the tangible property at the opening of the year and adding thereto one-half of the sum of additional money so spent for additions to the company's tangible property during this calendar year; and throughout the period of this grant the value of the plant at the opening of each calendar year and the average investment during such year shall be computed in the manner described.

* There should be some reasonable limitation upon the amount which may be invested in stock of materials as in the case of working capital.

The aforesaid depreciation and insurance fund shall be held in a bank or banks designated by the city as a depository or depositories, drawing suitable interest not less than three per cent. per annum, and shall be used only for renewals of plant and in other respects to meet the requirements of the depreciation and insurance account, except that the company may borrow temporarily from the fund as described hereinafter.

The appraisal of the company's tangible property to be made in pursuance of this section shall be carried out by a Board of Appraisal, composed of three competent engineers, to be appointed, one by the city, one by the company, and the said two appointees to appoint the third, and if the city or the company does not make such appointment within thirty days after the filing of the acceptance of this grant by the company, the Board of Appraisal shall thereupon, upon the request of either party, be filled by the then judges of the First District Appellate Court of the State of Illinois, or a majority of them, and the said board so appointed shall have the same powers and rights as though appointed by mutual consent of the city and company.

It is further agreed that the foregoing percentage allotted for a depreciation and insurance fund may be reviewed, after a period of five years, by a suitable commission of three engineers, appointed by the mutual agreement of the city and company, and in case a commission so appointed shall find that a different percentage under the then existing conditions should be set aside for depreciation and insurance, their finding shall be binding thereafter, except that a new review of the said percentage for depreciation may be made in like manner at the end of each five years.

Money from the said depreciation and insurance fund shall be used only for the purpose of renewing portions of the plant which require renewing on account of having reached the limit of their useful life, or of renewing property damaged by the act of God, and for the net cost of reconstruction made necessary by city improvements ordered by the City Council. These expenditures shall be made with the concurrence and approval of the City Comptroller, and any unexpended balance remaining in the fund at the expiration of this grant shall be paid to the city.

The company shall have the privilege of borrowing from this fund for the actual net costs of making additions to its plant, but all such borrowed sums shall be returned to the fund by the company, with interest at the rate of five per cent. per annum, as often as may be required by the City Comptroller.

Computations of the percentage to be set aside for the fund to cover depreciation, reconstruction and insurance, which we have designated the Depreciation and Insurance Fund, are indicated in Tables Nos. 6, 7 and 8, which respectively show the figures of the engineer of the Manufacturers' Telephone Company, the engineers of the Chicago Telephone Company, and the figures of the Commission.

The figures that Mr. Johnston presented to the Commission on behalf of the Manufacturers' Telephone Company are computed for a plant corresponding

with his revised construction estimate. He only makes an allowance for depreciation in the table, but in his revised expense estimate makes an additional annual allowance of $390,000 as a "reserve for repairs" (see our Table No. 2), which can be used for defraying the cost of reconstruction required by city improvements, etc.

Mr. Johnston does not take into account any accretions to the depreciation account by interest and he does not take account of salvage. We have therefore added the last three columns to Table No. 6 which take these two elements into account, assuming interest at the rate of 3 per cent. As Mr. Johnston's figures are given by him, the annual depreciation allowance is just under 6 per cent of the original cost. This is shown by column 5 of the table, the first five columns of this table being given by Mr. Johnston. But when compound interest at 3 per cent and salvage are taken into account, the annual contribution for depreciation becomes only 4.11 per cent, according to the lengths of life for the plant which Mr. Johnston assumes. On the latter basis, the depreciation added to Mr. Johnston's annual allowance to "reserve for repairs," brings his total annual charge for this fund to 7.2 per cent of the first cost of the property upon which depreciation is figured.

TABLE NO. 6.

Depreciation estimate of engineer of Manufacturers' Telephone Co.
NOTE.—Columns 6, 7 and 8 added by Telephone Commission.

1	2	3	4	5	6	7	8
PROPERTY.	Original Cost.	Life in Years.	Per Cent Depreciation. (No Interest.)	Amount Depreciation.	Per Cent to Depreciation Account Allowing 3% Interest.	Per Cent Salvage.	Annual Contribution to Depreciation Fund.
Conduits	$ 3,425,000	50	2	$ 68,500	.89	0	$ 30,500
Cables	3,274,000	20	5	163,700	3.72	40	73,100
Poles	1,300,000	20	5	65,000	3.72	0	48,400
Wires (Iron)	615,000	6⅔	15	92,250	13.76	0	84,600
Instruments	1,450,000	10	10	145,000	8.73	5	120,300
Switchboards	1,580,000	12½	8	126,400	6.71	20	84,800
Buildings	907,000	20	5	45,350	3.72	0	33,700
Tools, furniture, etc.	100,000	2	50	50,000	49.26	10	44,300
Total	$12,651,000	...	..	$756,200	.....	..	$519,700
Per cent. of original cost	.....	....	..	5.98	.....	..	4.11

NOTE.—Engineer of Manufacturers' Company also provides a reconstruction fund through an annual charge of $390,000 for an emergency reserve, in addition to the depreciation fund.

Table No. 7 exhibits the figures presented to us by the engineers of the Chicago Telephone Company. The second column of this table gives estimated values of the different parts of the plant, based on the original cost of the company's property in use in Chicago at the end of 1905, omitting land. The aggregate percentage computed from this table, in our opinion, is too high, as we have already pointed out. It is also to be said that the proportions allowed in the reconstruction items in this table are not confined, as they should be, to special insurance and the estimated annual expense of the reconstruction caused by city improvements ordered by the City Council.

TABLE NO. 7.

Estimate of depreciation and reconstruction made by engineers of Chicago Telephone Co., allowing compound interest at 3 per cent. per annum.

1	2	3	4	5	6
PROPERTY.	Original Cost.	Life in Years.	Per Cent Salvage.	Per Cent to Reconstruction.	Total Annual Contribution to Fund.
Underground conduit, main, including all types of construction	$ 1,501,629.11	33	0	1	$ 42,045.61
Underground conduit, subsidiary	448,538.57	14	0	2	35,210.27
Underground cable, main	1,981,734.12	16½	42	2	94,528.71
Underground cable, subsidiary	495,433.53	12	42	2	30,122.35
Aerial cable	743,052.09	11	34	3	60,558.74
Poles, including cross-arms	1,299,407.67	8½	0	6	214,922.02
Aerial strand	18,669.65	12½	0	4	2,001.39
Aerial terminals	93,348.25	12½	0	8	13,740.86
Aerial wire, copper	929,748.59	15	70	5	61,363.41
Aerial drop wires	649,703.84	7½	12½	10	133,838.99
Subscribers' instruments	2,428,790.72	10	0	5	333,230.08
Private Branch Exchange switchboards	720,802.40	10	0	5	98,894.08
Central Office switchboards	2,073,612.72	7	2	6	387,765.58
Buildings, fireproof	932,994.59	33	0	1½	30,788.82
Furniture, fixtures, etc., including tools and teams	214,015.55	4	0	0	51,149.58
Total	$14,531,481.40	...	...	...	$1,590,160.49
Per cent. of original cost	.....	...	...	...	10.9

It is well understood that operating plant is limited in life, and (however well ordinary repairs have been kept up) after a period of years the generally worn out condition of the equipment or the advance of the art makes a substitution of new equipment desirable and economical. The expense of this substitution which does not increase the gross earning capacity cannot be fairly charged to capital account, but should be defrayed out of a suitably supported depreciation fund which has been gradually accumulated out of the earnings during the life of the equipment, and which, at the end of the life period, has become equal to the first cost of the original equipment diminished by the amount of any "scrap" value or salvage which may be obtained from the discarded equipment. Interest accretions will add to the amount as the fund grows, and the annual sum set aside out of the earnings should be adjusted with this in view. Three per cent is a conservative rate of interest to set as the minimum which ought to be accepted on the moneys of a trust fund, within which category this depreciation fund belongs, and our table is computed on the basis of that percentage. A higher rate of interest would obviously decrease the size of the annual contributions to the fund which must be made from earnings, but it is not safe to count upon a higher rate of interest being procurable for a trust fund.

The rate at which the telephone art is advancing, and the delicacy of the apparatus used, makes it a matter of particular importance for a telephone company to establish a proper depreciation fund. Depretiation is distinct from maintenance, which latter includes current repairs that are required to keep the plant in first-rate working order as long as it is economically workable at all.

When dealing with reconstruction we have tried to arrive at the best judgment of the effect of future street and park improvements on the existing plant of the Chicago Telephone Company; and we have given due consideration to the fact that the telephone conduit and cable equipment in the heart of the city is likely to be soon disturbed by the construction of street railway subways.

The computations of the Commission are made on the basis of the original cost of the tangible property, excluding land, stock of materials and cash on hand, owned by the Chicago Telephone Company within the city of Chicago at the end of 1905. This differs from the "book value" of the same part of the property by an amount equal to the sums heretofore written off for depreciation. We consider it proper to make our estimate of the depreciation rate on the basis of the first cost. The percentage values attributed to the depreciation fund will be approximately the same for other years, and are applicable to present conditions within the city of Chicago. We have taken the estimate of the relative values of the different subdivisions of the plant as set forth by the engineers of the Chicago Telephone Company. An independent verification of the accuracy of these subdivisions of the total

cost was impossible on account of the limited time at our disposal, but they appear to us to be reasonably accurate.

Table No. 8 gives our estimate of the Depreciation and Insurance Fund. The percentage of the plant cost to be set aside each year for a reserve for depreciation, reconstruction and special insurance aggregates 8 per cent. Of this, the depreciation reserve is $5\frac{3}{4}$ per cent of the cost of the plant, and the reserve for reconstruction and insurance is $2\frac{1}{4}$ per cent.

The first column of Table No. 8 names the subdivisions of the plant; the second column gives the value of plant in each subdivision; and the following columns contain our estimates. As shown in the table, the life of underground conduit is long, but it affords no salvage. The reconstruction expense which we estimate for conduit includes the effect of sewer construction, park improvements, etc., and the probable effect of the future construction of street railway subways in the heart of the city. The salvage of cables is high on account of the relative ease of removing cables and the large percentages of recoverable copper and lead which they contain. The reconstruction estimate for cables is made to cover the effect of sewer construction, park improvements, etc., and street railway subways. Pole lines and their appurtenances are relatively short lived. There is very little salvage except from the aerial copper wires and cables. The reconstruction estimate is made with a consideration of street and park improvements, future extension of the underground boundaries, track elevation, etc.

Private branch exchange and central office switchboards are of notably short average life on account of the rapid rate at which the art is advancing, but the salvage is considerable because parts of the old equipment can be modified for use in the construction of the new, or the discarded equipment sometimes has a value for use in less important centers. The estimates set down in columns 7 and 8 in connection with the switchboards and subscribers' instruments, are made to cover fire insurance in excess of that which can be carried at reasonable rates with the underwriters.

The total of our estimates for reconstruction and insurance is somewhat over half as large as the corresponding total of the estimates presented by the Chicago Telephone Company, but the engineers of that company have included in their estimates some expense caused by the moving of customers and the like, which belongs in ordinary maintenance and is not a proper charge against this fund.

This Table No. 8 is made out on the plant values of the Chicago Telephone Company, but we believe that the final figures obtained from the computations are reasonably applicable to any similar telephone plant located in Chicago.

TABLE NO. 8.

Estimate of Depreciation and Insurance Fund made by Commission.

1	2	3	4	5	6	7	8	9
PROPERTY.	Original Cost.	Life in Years.	Per Cent to Depreciation Account.	Per Cent Salvage.	Annual Contribution for Depreciation.	Per Cent to Reconstruction and Insurance Account.	Annual Contribution for Reconstruction and Insurance.	Total Annual Contribution to Fund.
Underground conduit, main, clay in concrete.	$ 1,126,200	50	.89	0	$ 10,000	1½	$ 22,500	$ 46,500
Underground conduit, main, fibre, etc.	375,400	20	3.72	0	14,000			
Underground conduit, subsidiary	448,500	20	3.72	0	16,700	2	9,000	25,700
Underground cable, main	1,981,700	20	3.72	40	44,200	2	39,600	83,800
Underground cable, subsidiary	495,400	15	5.38		16,000	2	9,900	25,900
Aerial cable	743,100	15	5.38		24,000	3	22,300	46,300
Poles, including cross-arms, etc	1,299,400	10	8.73	0	113,400	4½	58,500	171,900
Aerial strand	18,700	12	7.05	0	1,300	3½	700	2,000
Aerial cable terminals	93,400	12	7.05	0	6,600	3	2,800	9,400
Aerial wire, copper	929,700	15	5.38	70	15,000	3	27,900	42,900
Drop wires, copper	649,700	8	11.25	15	62,100	4	26,000	88,100
Subscribers' station instruments	2,428,800	10	8.73	5	201,400	2	48,600	250,000
Private Branch Exchange switchboards	720,800	8	11.25	20	64,900	2	14,400	79,300
Central Office switchboards	2,073,600	8	11.25	20	186,600	2	41,500	228,100
Buildings, fireproof	933,000	40	1.33	0	12,400	1	9,300	21,700
Teams, tools, furniture, etc	214,000	4	23.92	10	46,100	0	.....	46,100
Total	$14,531,400	..	.....	...	$834,700	....	$333,000	$1,167,700
Per cent. of original cost	.....	...	.....	...	5.74	....	2.29	8.03

The underground district to be required of any company receiving a franchise has been defined to conform with the lines agreed to by the Chicago Telephone Company in conference with your committee. The boundary of this district is shown by the full line in Map No. 2. The underground district fixed by the terms of the Chicago Telephone Company's ordinance of 1889 is shown by the dot and dash line of the same map; and the boundary of the underground district defined by the proposed ordinance printed by the Manufacturers' Company is shown by the dotted line. It is our understanding that the Manufacturers' Company have undertaken to extend the boundary of their proposed underground district to bring it to coincide with that of the Chicago Telephone Company's proposed boundary.

The proposed ordinance section is as follows:

> SECTION —. The Chicago Telephone Company shall place and keep in underground conduits all the wires, cables and electrical conductors which it may now or hereafter have in or on the streets, within the following boundaries, namely: Commencing at the intersection of Lake Michigan and Howard Avenue, thence west on Howard Avenue to East Ravenswood Park Avenue, south to Irving Park Boulevard, west to Western Avenue, south to Diversey Boulevard, west to Kedzie Avenue, south to Chicago Avenue, west to 40th Avenue, south to 26th Street, east to Center Avenue, south to 79th Street, east to Vincennes Road, north to 69th Street and east to Lake Michigan.

IV.

THE DESIRABILITY AND PRACTICABILITY OF UNIVERSAL TOLL CONNECTIONS WITH THE CITY OF CHICAGO.

In order to determine whether it is desirable or practicable to require, by ordinance, any telephone company operating in the city of Chicago to connect with any or all companies operating outside of Chicago, for the purpose of transmitting toll or long distance messages, it is necessary to consider the two principal ways by which telephone service is furnished, namely: by "Bell companies" and "Independent companies."

The term Bell is applied to all companies operating under licenses and sub-licenses from the American Bell Telephone Company, and the term Independent is applied to all companies which have no direct relations with the Bell companies, and which are usually operated in competition with them. The so-called sub-license companies are, in most instances, companies which were originally Independent in their organization, but which have entered into contract relations with Bell Companies for the purpose of interchanging service. Most of these sub-license companies are situated in localities where the Bell companies have never established plants, or where Bell plants have been established and later consolidated with the Independent plant and

operated under a sub-license arrangement, so that, so far as we are concerned in the consideration of this question, the sub-license companies are classified with the Bell companies.

As is well known, the service of the Bell companies extends throughout practically all the principal cities and towns of the country, and these cities and towns are connected by an extensive system of long distance and toll lines. The Independent companies, during the past few years, have developed extensively, having well established exchanges in a majority of the large cities and towns, and are rapidly developing their toll and long distance lines connecting these exchanges, which, in many localities, are as extensive and, in some, more extensive, than those of the Bell. Their inter-urban telephone lines and county systems, furnishing telephone service in the rural communities, were first established, and their growth has been so great as to form a very important factor in the commercial development of many localities.

Investigation shows that approximately ninety per cent. of all toll and long distance messages in and out of Chicago are transmitted in an area contained within a radius of 100 miles from the central part of the city.

In order to determine whether it is necessary, from a business standpoint, to require the Chicago Telephone Company, should it be granted a franchise, to provide telephone connections and facilities with any and all telephone companies doing business outside the city, we have tried to ascertain the number of incorporated cities, towns and villages, having a population of 500 inhabitants or more and located within a radius of 100 miles of the central part of Chicago, which at present have no telephone connection with the city. We have studied this territory carefully, spending a large amount of time gathering data from every available source, but, as far as we could learn, there are no such incorporated cities, towns or villages which at present do not have telephone connections with Chicago.

We have endeavored to obtain similar information regarding the exchange and toll line connections of the Independent companies within the same area, but could not find such reliable information available. We did secure, however, enough information to convince us that, should a franchise be granted to an Independent company in the city, and the Chicago Telephone Company be denied a franchise and its plant cease to be operated, there would then be many towns within the above area cut off from telephone communication with the city, unless the present Bell companies operating therein and the Independent company in the city would voluntarily, or by requirement, connect their lines and interchange service.

From the above it will be seen that, under present conditions, there is ample opportunity for all people within this area to provide themselves with telephone connection to the city, but that, should the Chicago Telephone Company's plant be displaced by an Independent plant, then with the area as it is now developed by the Independents, it would be desirable to provide

some means for connecting the outside Bell lines with the lines of the Independent company in Chicago.

In regard to the demands of the Independent telephone companies for obtaining toll connection with the city, it is our understanding that all of the demands that have been made have originated with a view to obtaining such toll connections, not with a Bell company, but with an Independent company, to be established within the city. In view of recent events connected with the history of the Illinois Tunnel Company, there is reason to believe that the telephone business of that company will be developed, and that arrangements will be made for carrying on a toll and long distance business with the outside Independent telephone companies.

We have found, by careful inquiry, that the responsible Independent companies outside of Chicago having no toll connection with the city, do not desire such connection with a Bell company, but that they do desire such connection provided it can be made with an Independent company doing business within the city.

One of the principal advantages to be derived by the Independent telephone companies outside of the city and by the subscribers to their systems would be that, having an Independent telephone connection with the city, many of the subscribers would be relieved of the necessity of maintaining two telephones, as they are now doing, the Bell telephone being maintained for the principal purpose of furnishing facilities for long distance business.

The practicability of enforcing Independent telephone companies to connect with Bell companies, or vice versa, by ordinance, has several serious objections, when viewed from the technical and operating standpoints. In order that a satisfactory interchange of telephone service may be effected, business harmony must exist between the connecting companies, and suitable arrangements must be made which will insure good service. Arrangements for good toll service require that all operating rules should be similar, and that they should be vigorously enforced by all companies interchanging business, and this requires unity of purpose, and that some central management or organization shall be ultimately responsible for the methods of handling the service. A high standard of transmission is required for toll and long distance business, and it is impracticable to maintain such a standard unless the necessary telephone equipment is designed, manufactured, installed and operated with that point in view. The ease with which the service can be interfered with by either party to an arrangement of this kind, and the practical impossibility of fixing the responsibility for such interference, would make it impossible to furnish good service, unless it was the desire of the two companies that such good service should be furnished. It is our opinion that these conditions could not be brought about by an ordinance requiring any telephone company within the city of Chicago to connect its lines and interchange service with any telephone company outside the city.

In case a franchise is granted to the Chicago Telephone Company, all important towns outside of Chicago will be connected, as they now are. In case a franchise is granted to an Independent company, and the Chicago Telephone Company's plant ceases to be operated, it would then be desirable to have the Independent company in Chicago furnish connection to the Bell companies outside; but, even though such a connection is desirable, it would hardly prove practicable unless it was voluntary on the part of both companies.

Our consideration of the question leads us to the conclusion that enforced connection between these two interests, against the wishes of either, or both, would be conducive to poor service, and in the end would prove very unsatisfactory to both the telephone companies and the public.

V.

CONCLUSIONS.

1. The project of the Manufacturers' Telephone Company is not feasible, because

(*a*) A plant to replace the service of the Chicago Telephone Company could not be constructed in less than double the time available, and even that minimum of time would be so short as to result in confusion and inconvenience during the early months of operation of the new plant.

(*b*) The semi-automatic mode of operation proposed by the Manufacturers' Telephone Company is substantially untried as a commercial arrangement for use on a large scale. It bears indications of being a desirable method of telephone operation, but it has not yet been fully developed and it is unwise to make an experimental trial in so large a plant as that required to give service to the entire city of Chicago. Even if the apparatus adopted ultimately proved successful, the confusion resulting from defects which always appear in new and untried apparatus would probably produce confusion for many months after the plant was put in operation.

(*c*) The methods of charging and rates proposed by the Manufacturers' Company are not adapted to enable the company to give first class service throughout the city and pay ordinary interest on the investment, after setting aside reasonable reserves for depreciation and contingencies, and the company's operations, if extended throughout the city, would ultimately result in financial difficulties or an application to the Council for the privilege of changing their schedule of rates.

2. Measured rates should be adopted for general service, because

(*a*) They require each user to pay for his service in proportion to what he uses. This makes it possible for the telephone operating company to base its rates for each class of service on the actual cost of the service, thereby

bringing the service within the means of the largest number of people and expanding it so as to be of the maximum usefulness in the city.

(*b*) Measured rates largely cut off frivolous and otherwise useless messages, thereby leaving the subscribers' lines open for all important messages.

(*c*) The reduction of calls per telephone following the general use of measured rates results in a great reduction of the unavailing calls, which are now approximately one-third of the total calls in Chicago, and it thereby reduces the expenses of operating, and this makes a general reduction in the rates practicable.

(*d*) The introduction of measured rates tends to level off the load curve, reducing the relative height of the peaks, so that the actual cost of operating for each message passed through the hands of the telephone company becomes less, and this also tends toward making a reduction in the price of telephone service practicable.

3. A partial use of flat rates may be applied in connection with residence and neighborhood exchange telephones, because

(*a*) These telephones are subject to a smaller average use than city rate business telephones and the flat rates applied to them do not so seriously increase the unavailing calls; also the use of the individual telephones in these classes does not differ so greatly from the average use.

4. Three-party line residence telephones at fifty-one dollars per year for each telephone are recommended for trial, as an addition to the schedule of rates proposed by the Chicago Telephone Company, in case that company is granted a franchise.

(*a*) The management of the Chicago Telephone Company argues cogently that experience demonstrates that four-party line flat rate residence telephones cause bad service on account of the overloading of the lines unduly increasing unavailing calls, and on account of the mutual interference with each other which occurs between subscribers.

(*b*) They admit that two-party line flat rate residence service is satisfactory.

(*c*) We believe that three-party line flat rate residence service will give reasonably satisfactory service and will be popular, and recommend its trial on that ground.

5. We condemn the service of more than four parties on any line, because

(*a*) It produces bad results from overloading the lines and from mutual interference between subscribers.

6. The Chicago Telephone Company has a desirable plant in use and can give good service. We have consulted with Mr. Maclay Hoyne, who has outlined an ordinance which we believe will result in obtaining for the people of the city good service at a minimum cost in case the Chicago Telephone Company is granted a franchise.

We direct your attention particularly to the schedule of rates and to two alternative means which we believe will afford satisfactory control of rates.

(*a*) The first reserves by contract the right to the City to reasonably regulate rates at certain intervals.

(*b*) The second limits the net earnings of the company and requires any excess of net earnings over the limit to be paid to the City.

7. We recommend that in case the Chicago Telephone Company is given a franchise, the company be required to start a separate set of records and books of account relating to its business within the city of Chicago, and that these shall be arranged so as to afford data for determining the average costs of the several classes of service.

(*a*) For this purpose we have proposed that the accounts and records shall be kept in a manner satisfactory to the City Comptroller.

(*b*) And we further recommend the employment by the City of a consulting engineer to advise with the Comptroller and the company upon the best form of records to be kept, in order that the costs of the different classes of service may be reasonably well known after the end of two years.

8. We recommend that the City Comptroller, after two years, place before the City Council a statement of the cost of service in the different classes as nearly as may be practicable, for the information of the Council in further regulation of rates, in case the Chicago Telephone Company is given a franchise with the right of regulation reserved to the City according to our first alternative.

9. To require an operating company to make toll connections with every applicant company, does not seem to us practicable or desirable for several reasons, of which the following are sufficiently conclusive:

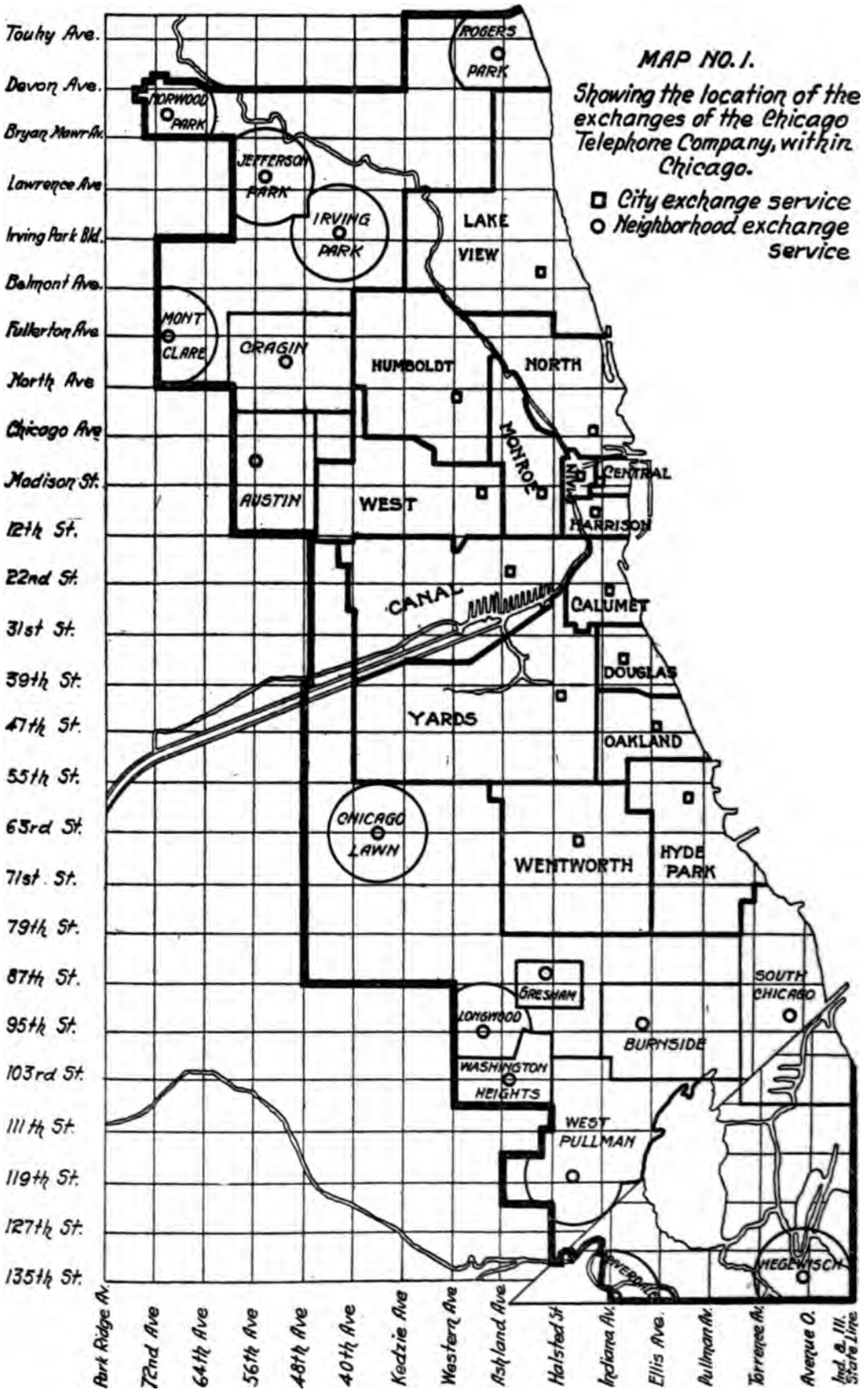
(*a*) Business harmony must exist between companies doing a joint toll business and the plant of each must be maintained to the satisfaction of the other, or the toll service will be seriously impaired or rendered valueless. The necessary harmony and unity of purpose cannot be obtained by ordinance.

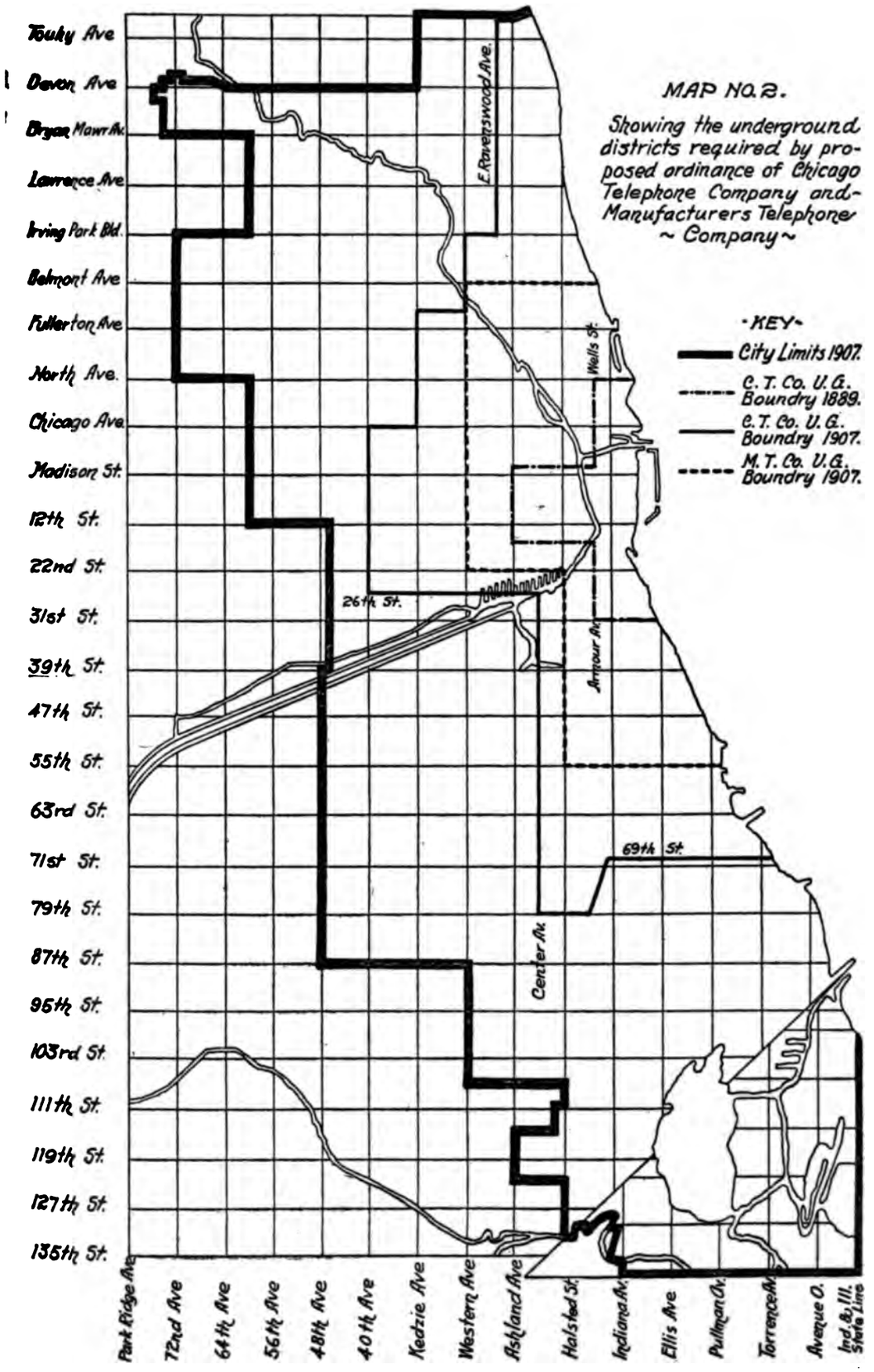
(*b*) We have studied the toll situation within a radius of 100 miles from Chicago and find that this area, under present conditions, is well provided with telephone connections entering Chicago.

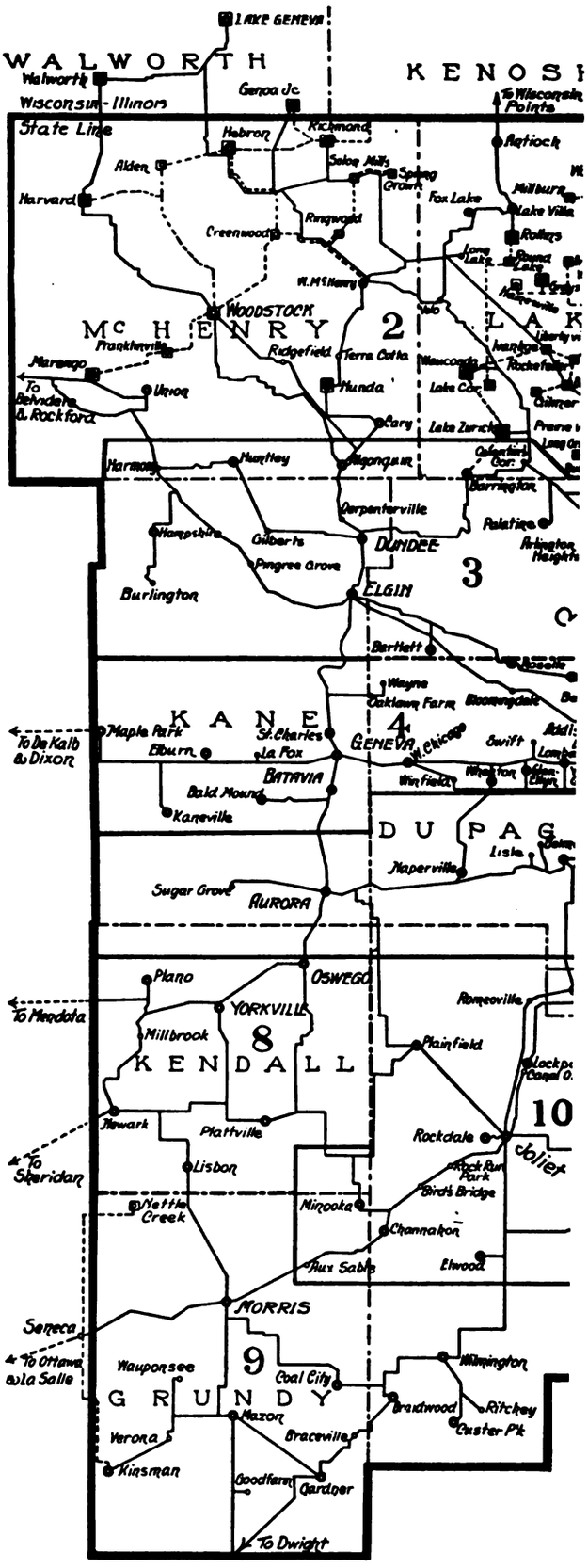
(*c*) Our inquiries show that "telephone free trade" is plainly not desired by the people of responsibility related to either the Bell or the Independent companies.

Respectfully submitted,

(Signed) DUGALD C. JACKSON,
WILLIAM H. CRUMB,
GEORGE W. WILDER.


MAP NO. 1.
Showing the location of the exchanges of the Chicago Telephone Company, within Chicago.
City exchange service
Neighborhood exchange service
Touhy Ave.
Devon Ave.
Bryan Mawr Av.
Lawrence Ave
Irving Park Blvd.
Belmont Ave.
Fullerton Ave
North Ave
Chicago Ave
Madison St.
12th St.
22nd St.
31st St.
39th St.
47th St.
55th St.
63rd St.
71st St.
79th St.
87th St.
95th St.
103rd St.
111th St.
119th St.
127th St.
135th St.
ROGERS PARK
NORWOOD PARK
JEFFERSON PARK
IRVING PARK
LAKE VIEW
MONT CLARE
CRAGIN
HUMBOLDT
NORTH
MONROE
CENTRAL
AUSTIN
WEST
HARRISON
CANAL
CALUMET
DOUGLAS
YARDS
OAKLAND
CHICAGO LAWN
WENTWORTH
HYDE PARK
GRESHAM
SOUTH CHICAGO
LONGWOOD
BURNSIDE
WASHINGTON HEIGHTS
WEST PULLMAN
HEGEWISCH
Park Ridge Av.
72nd Ave
64th Ave
56th Ave
48th Ave
40th Ave
Kedzie Ave
Western Ave
Ashland Ave.
Halsted St.
Indiana Av.
Ellis Ave.
Pullman Av.
Torrence Av.
Avenue O.
Ind. & Ill. State Line


Touhy Ave.
Devon Ave.
Bryan Mawr Av.
Lawrence Ave.
Irving Park Bld.
Belmont Ave.
Fullerton Ave.
North Ave.
Chicago Ave.
Madison St.
12th St.
22nd St.
31st St.
39th St.
47th St.
55th St.
63rd St.
71st St.
79th St.
87th St.
95th St.
103rd St.
111th St.
119th St.
127th St.
135th St.
Park Ridge Ave.
72nd Ave.
64th Ave.
56th Ave.
48th Ave.
40th Ave.
Kedzie Ave.
Western Ave.
Ashland Ave.
Halsted St.
Indiana Av.
Ellis Ave.
Pullman Av.
Torrence Av.
Avenue O.
Ind. & Ill. State Line
E. Ravenswood Ave.
Wells St.
Armour Av.
Center Av.
26th St.
69th St.
MAP NO. 2.
Showing the underground districts required by proposed ordinance of Chicago Telephone Company and Manufacturers Telephone Company
KEY
City Limits 1907.
C. T. Co. U. G. Boundry 1889.
C. T. Co. U. G. Boundry 1907.
M. T. Co. U. G. Boundry 1907.


LAKE GENEVA
WALWORTH
KENOSH
Walworth
Wisconsin - Illinois
Genoa Jc.
To Wisconsin Points
State Line
Hebron
Richmond
Antioch
Alden
Salem Mills
Spring Grove
Harvard
Fox Lake
Millburn
Lake Villa
Ringwood
Greenwood
Rollins
Long Lake
Round Lake
W. McHenry
WOODSTOCK
McHENRY 2
LAK
Franklinville
Ridgefield
Terra Cotta
Ivanhoe
Marengo
To Belvidere & Rockford
Union
Hunda
Lake Co.
Cary
Lake Zurich
Harmony
Huntley
Algonquin
Carpentersville
Barrington
Palatine
Arlington Heights
Hampshire
Gilberts
DUNDEE
Pingree Grove
3
Burlington
ELGIN
Bartlett
Wayne
Oaklawn Farm
Bloomingdale
KANE
4
To DeKalb & Dixon
Maple Park
St. Charles
GENEVA
Elburn
La Fox
Swift
BATAVIA
Winfield
Bald Mound
Kaneville
DUPAG
Lisle
Naperville
Sugar Grove
AURORA
Plano
OSWEGO
To Mendota
YORKVILLE
Romeoville
Millbrook
8
Plainfield
KENDALL
Newark
Plattville
Rockdale
10
Joliet
To Sheridan
Lisbon
Rock Run Park
Birch Bridge
Yettle Creek
Minooka
Channahon
Aux Sable
Elwood
MORRIS
Seneca
To Ottawa & La Salle
Wauponsee
9
Coal City
Wilmington
GRUNDY
Braidwood
Ritchey
Custer Pk
Mazon
Braceville
Verona
Kinsman
Goodfarm
Gardner
To Dwight

DATA FOR CHART NO. 1.

Showing population of Chicago in the past, taken from School Census and Federal Census Reports.

Year.	Population, School Census.	Population, Federal Census.
1850	29,963	28,269
1853	50,130	.....
1856	84,113	.....
1860	.....	109,206
1862	138,186	.....
1864	169,353	.....
1866	200,418	.....
1868	252,054	.....
1870	306,605	298,977
1872	367,396	.....
1874	395,408	.....
1876	407,661	.....
1878	436,731	.....
1880	491,516	503,298
1882	560,693	.....
1884	629,985	.....
1886	703,817	.....
1888	802,951	.....
1890	1,208,669	1,099,850
1892	1,438,010	.....
1894	1,567,727	.....
1896	1,616,635	.....
1898	1,851,588	.....
1900	2,007,695	1,698,575

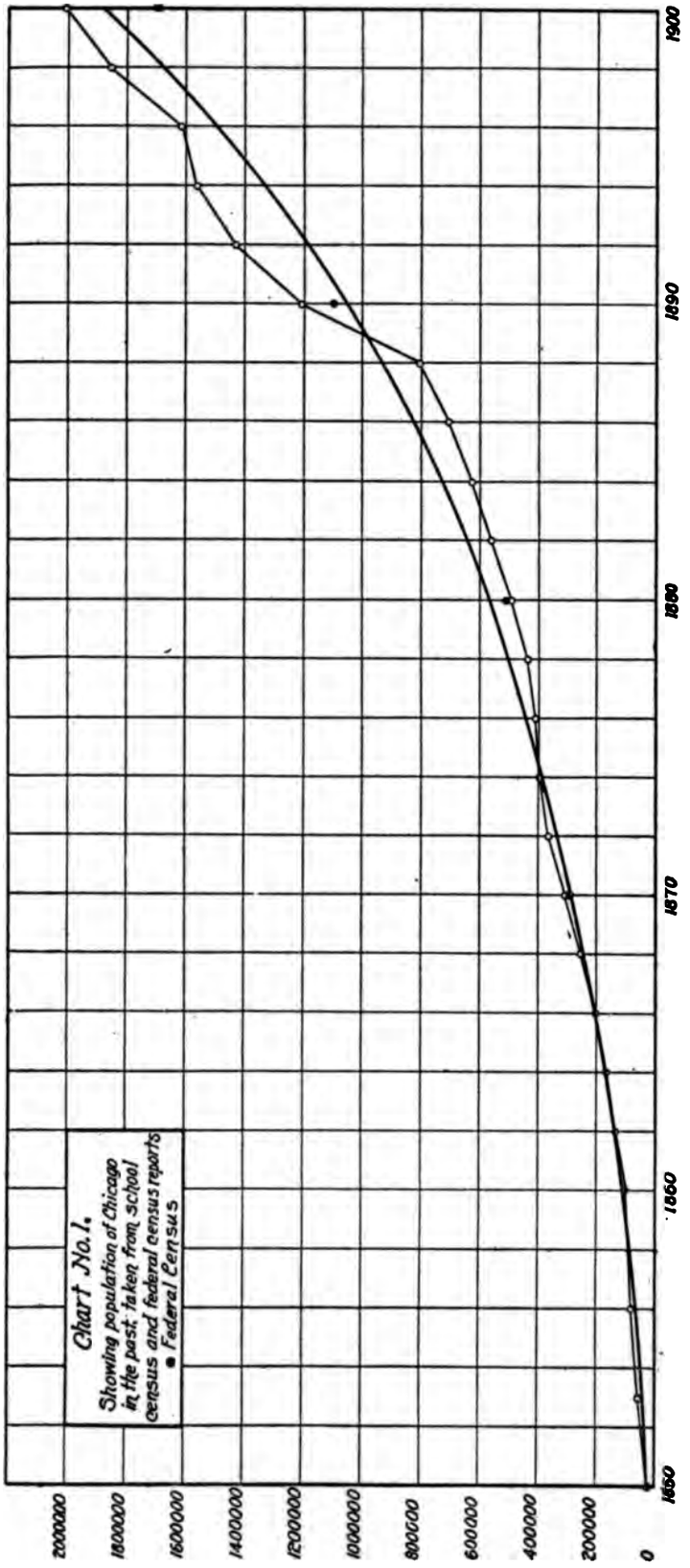


Chart No. 1.
Showing population of Chicago in the past: taken from school census and federal census reports
• Federal Censuses
2000000
1800000
1600000
1400000
1200000
1000000
800000
600000
400000
200000
0
1850
1860
1870
1880
1890
1900

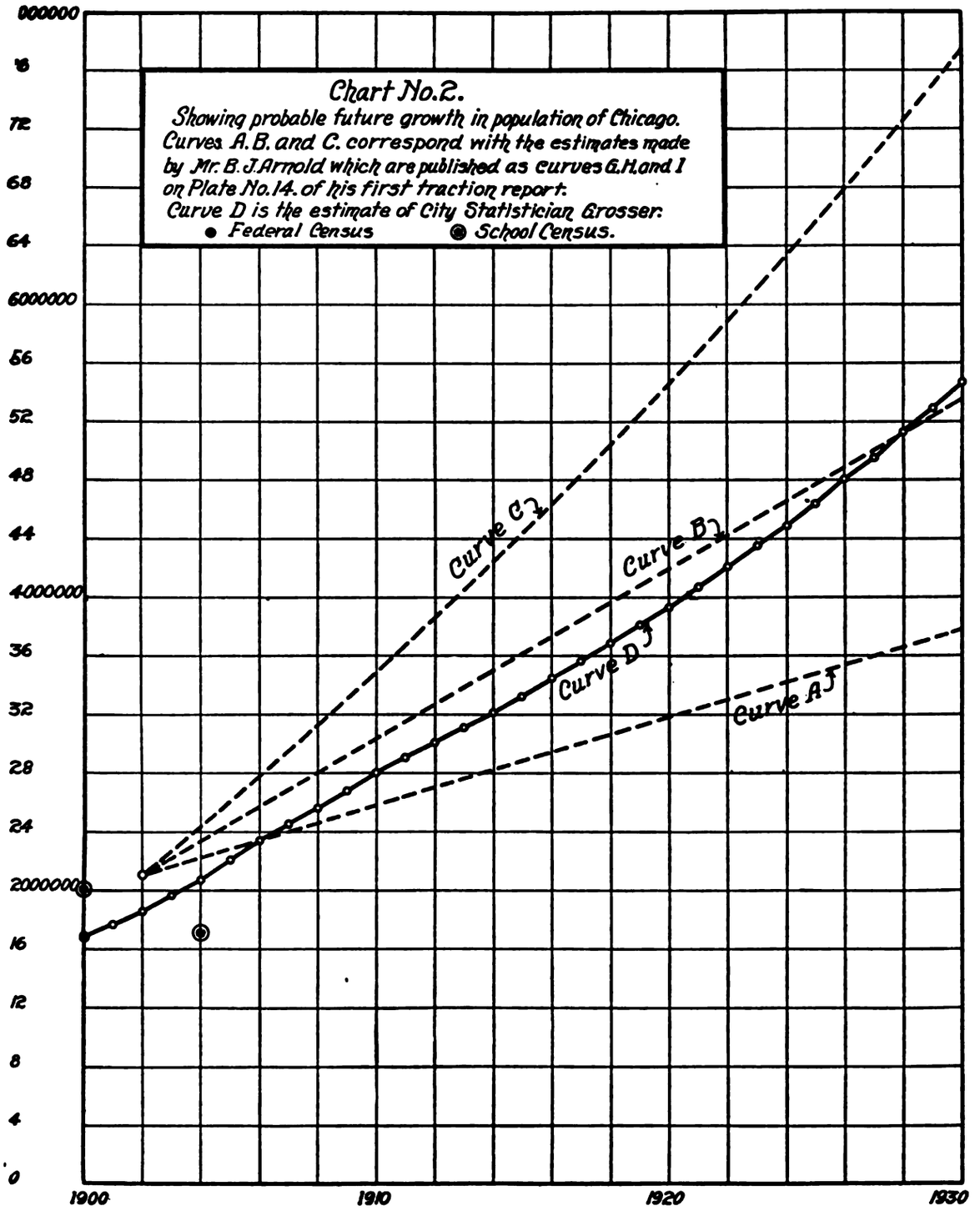


Chart No.2.
Showing probable future growth in population of Chicago.
Curves A. B. and C. correspond with the estimates made by Mr. B. J. Arnold which are published as curves G. H. and I on Plate No. 14. of his first traction report.
Curve D is the estimate of City Statistician Grosser.
● Federal Census ◉ School Census.
Curve C
Curve B
Curve D
Curve A
000000
8
72
68
64
6000000
56
52
48
44
4000000
36
32
28
24
2000000
16
12
8
4
0
1900
1910
1920
1930

DATA FOR CHART NO. 3.

Showing the growth of the area of the City of Chicago.

	Number of Square Miles.
Total area, March 4, 1837, the date of incorporation	10.635
First extension, February 16, 1847	3.375
Second extension, February 12, 1853	3.988
Third extension, February 13, 1863	6.284
Fourth extension, February 27, 1869	11.380
Fifth extension, May 16, 1887	1.000
Sixth extension, April 29, 1889	7.150
Seventh extension, July 15, 1889	126.070
Eighth extension, April 1, 1890	1.773
Ninth extension, May 12, 1890	2.899
Tenth extension, November 4, 1890	4.603
Eleventh extension, April 7, 1891	0.981
Twelfth extension, April 4, 1893	3.875
Thirteenth extension, November 7, 1893	2.125
Fourteenth extension, February 25, 1895	1.000
Fifteenth extension, April 4, 1899	3.500
Total area to date, square miles	190.638

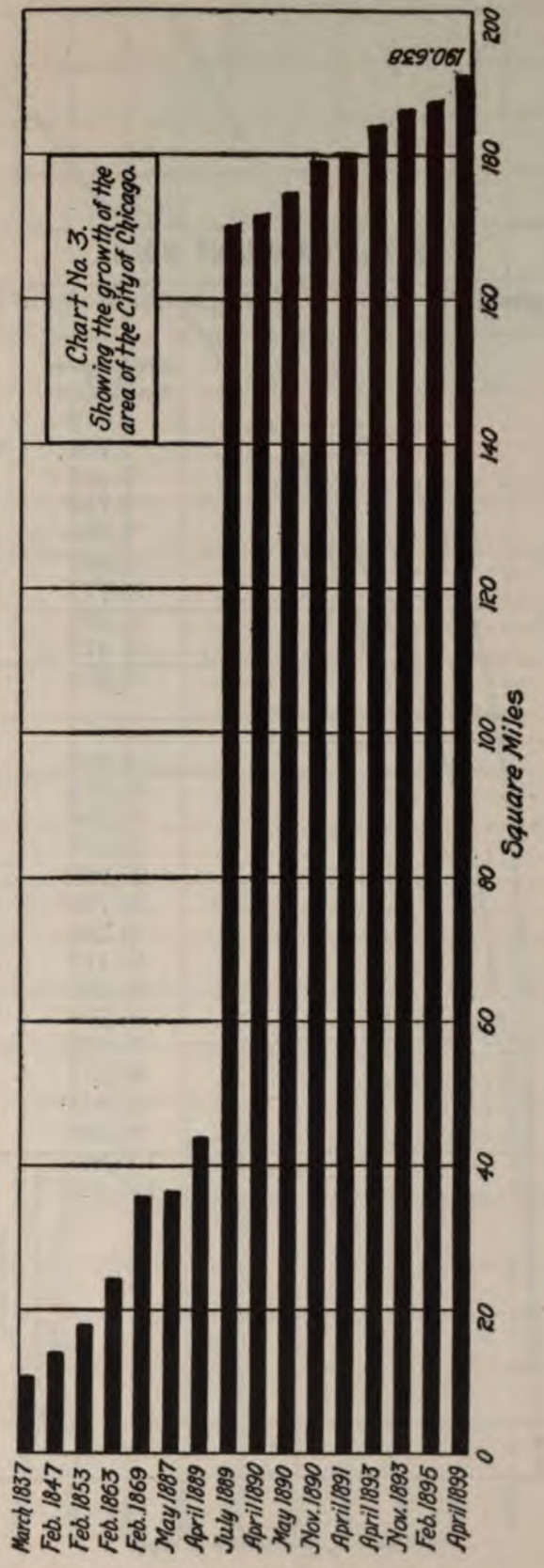
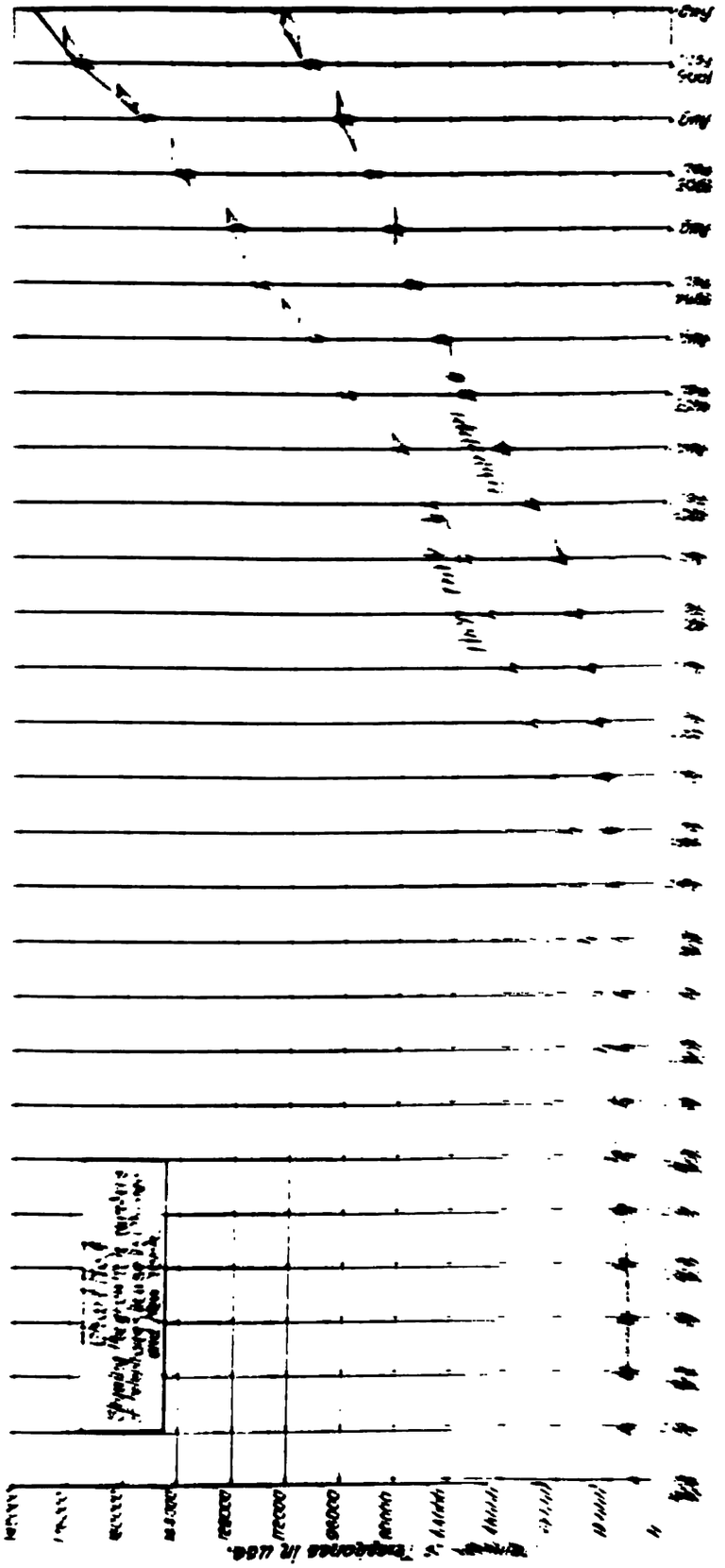


Chart No. 3.
Showing the growth of the area of the City of Chicago.
190,638
March 1837
Feb. 1847
Feb. 1853
Feb. 1863
Feb. 1869
May 1887
April 1889
July 1889
April 1890
May 1890
Nov. 1890
April 1891
April 1893
Nov. 1893
Feb. 1895
April 1899
0
20
40
60
80
100
120
140
160
180
200
Square Miles

DATA FOR CHART NO. 4.

Showing the growth in numbers of telephones in use in Chicago and New York.

Month	Year	Number Telephones. Chicago Exchange District.	Number Telephones. New York. (Manhattan and Bronx.)
February,	1893	8,679	.....
August,	1893	9,751	.....
February,	1894	9,443	11,218
August,	1894	9,744	.....
February,	1895	9,980	11,853
August,	1895	10,467	.....
February,	1896	10,777	14,647
August,	1896	11,291	.....
February,	1897	11,479	18,173
August,	1897	11,658	.....
February,	1898	.....	23,046
August,	1898	.....	.....
February,	1899	16,310	28,423
August,	1899	18,013	.....
February,	1900	20,380	40,437
August,	1900	23,187	.....
February,	1901	27,929	53,394
August,	1901	32,728	60,877
February,	1902	41,232	71,219
August,	1902	50,118	79,686
February,	1903	60,588	95,801
August,	1903	68,508	104,392
February,	1904	76,218	120,855
August,	1904	82,217	127,592
February,	1905	87,847	142,951
August,	1905	96,260	152,810
February,	1906	105,861	173,539
August,	1906	115,427	186,120



DATA FOR CHART NO. 5.

Showing the total originating "calls" per day in the "Chicago Exchange" District and the average number of "calls" per telephone per day.

Month.	Year.	Total Originating Calls.	Originating Calls per Telephone.
February,	1893	131,329	15.15
August,	1893	117,889	12.09
February,	1894	123,817	13.12
August,	1894	127,172	13.07
February,	1895	168,295	16.95
August,	1895	135,964	13.00
February,	1896	186,423	17.32
August,	1896	172,213	15.71
February,	1897	188,206	16.40
August,	1897	175,959	15.42
February,	1898	.....	.... -
August,	1898	.....	.... -
February,	1899	285,468	17.50
August,	1899	239,150	13.28
February,	1900	315,100	15.47
August,	1900	303,465	14.87
February,	1901	419,433	14.22
August,	1901	392,827	12.02
February,	1902	511,033	12.40
August,	1902	515,207	10.03
February,	1903	654,638	10.08
August,	1903	562,365	8.21
February,	1904	715,020	9.38
August,	1904	653,246	7.70
February,	1905	840,053	9.57
August,	1905	759,739	7.85
February,	1906	952,159	9.01
August,	1906	916,622	7.95

Chart No. 5.
Showing the "Calls" per day in the Chicago exchange district and the number of daily "calls" per telephone.
-Note-
Chicago has fewer telephones in use than New York, but makes more calls per day.
Daily calls per telephone
Total calls per day
Scale I
Scale II
Daily Calls per telephone
Total Calls per day
1893 Feb.
Aug.
1894 Feb.
Aug.
1895 Feb.
Aug.
1896 Feb.
Aug.
1897 Feb.
Aug.
1898 Feb.
Aug.
1899 Feb.
Aug.
1900 Feb.
Aug.
1901 Feb.
Aug.
1902 Feb.
Aug.
1903 Feb.
Aug.
1904 Feb.
Aug.
1905 Feb.
Aug.
1906 Feb.
Aug.

DATA FOR CHART NO. 6.

Showing the growth of the different classes of service in the "Chicago Exchange" District; that is, excluding the "Neighborhood" Exchange telephones, which aggregated 8,570 on January 1, 1907.

	Private Branch Exchange Telephones.	Flat Rate Business Telephones.	Flat Rate Residence Telephones.	Measured Service Telephones (Except Two-Party Line Telephones.)	Two-Party Line Telephones.	Extension Telephones.
August, 1901,	4,246	6,769	4,922	10,564	3,848	2,379
February, 1902,	6,385	6,755	5,240	11,406	8,912	2,534
August, 1902,	8,014	7,440	5,205	12,556	13,989	2,914
February, 1903,	10,562	7,049	5,526	14,983	19,128	3,340
August, 1903,	13,408	7,291	5,529	18,220	20,167	3,893
February, 1904,	15,475	7,461	5,736	20,872	22,299	4,375
August, 1904,	17,445	7,596	5,764	22,950	23,568	4,894
February, 1905,	18,643	7,801	6,096	24,916	25,107	5,284
August, 1905,	20,736	8,183	6,113	27,216	27,959	6,053
February, 1906,	22,550	8,393	6,509	29,538	32,216	6,655
August, 1906,	23,942	9,163	6,511	30,657	38,461	6,693

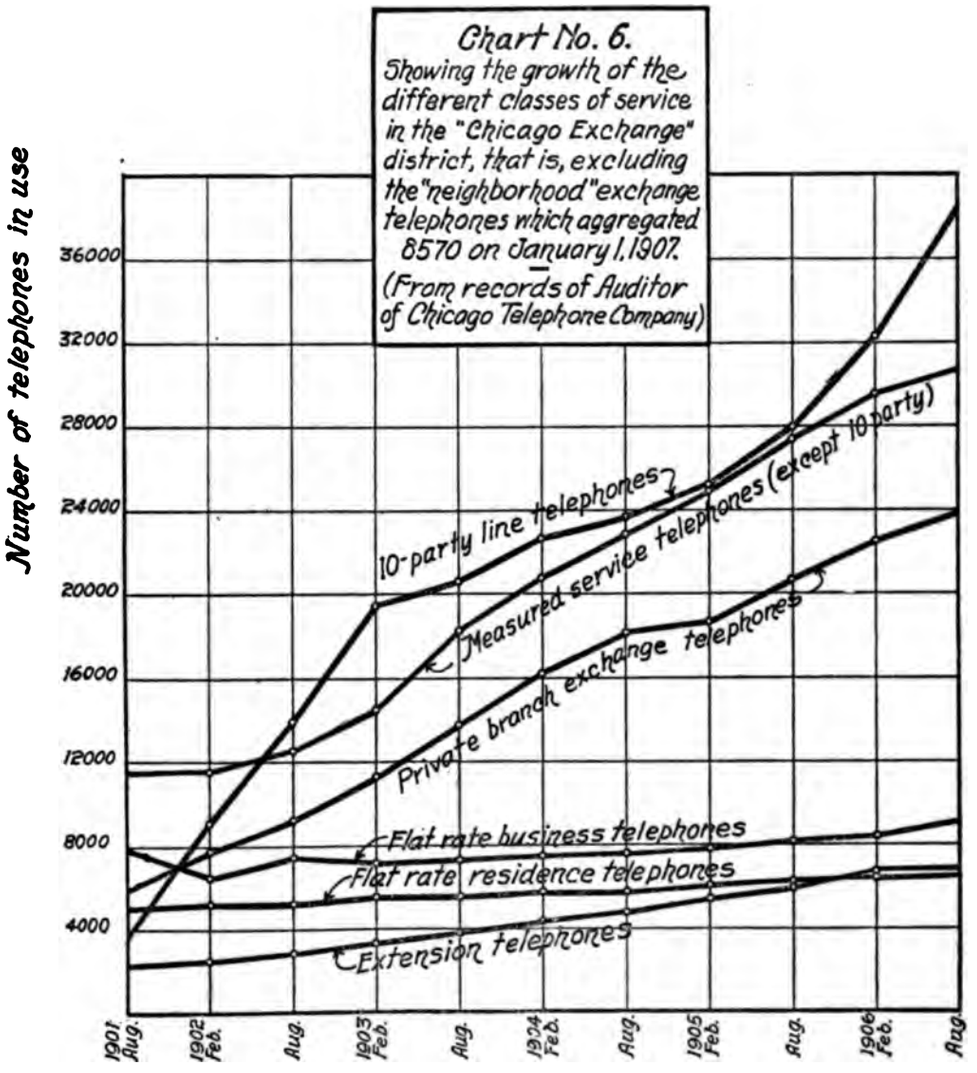


Chart No. 6.
Showing the growth of the different classes of service in the "Chicago Exchange" district, that is, excluding the "neighborhood" exchange telephones which aggregated 8570 on January 1, 1907.
(From records of Auditor of Chicago Telephone Company)
Number of telephones in use
36000
32000
28000
24000
20000
16000
12000
8000
4000
10-party line telephones
Measured service telephones (except 10 party)
Private branch exchange telephones
Flat rate business telephones
Flat rate residence telephones
Extension telephones
1901 Aug.
1902 Feb.
Aug.
1903 Feb.
Aug.
1904 Feb.
Aug.
1905 Feb.
Aug.
1906 Feb.
Aug.

DATA FOR CHART NO. 7.

Showing the numbers of flat rate lines (including commutation trunk lines connected with Private Branch Exchanges) and measured rate lines in "Chicago Exchange" District, excluding ten-party lines.

Month.	Year.	Number of Flat Rate Lines.	Number of Measured Rate Lines.
February,	1893	8,679	.....
August,	1893	9,751	.....
February,	1894	9,443	.....
August,	1894	9,744	.....
February,	1895	9,980	.....
August,	1895	10,467	.....
February,	1896	10,777	.....
August,	1896	11,291	.....
February,	1897	10,958	521
August,	1897	11,000	654
February,	1898	.....	.....
August,	1898	.....	.....
February,	1899	11,733	1,046
August,	1899	12,359	1,458
February,	1900	10,429	4,581
August,	1900	9,967	6,679
February,	1901	10,247	7,812
August,	1901	10,879	10,119
February,	1902	10,761	10,466
August,	1902	11,019	11,799
February,	1903	11,442	13,190
August,	1903	11,879	15,306
February,	1904	12,250	16,668
August,	1904	12,336	17,406
February,	1905	12,657	18,063
August,	1905	13,209	19,669
February,	1906	13,599	21,352
August,	1906	14,482	22,012

DATA FOR CHART NO. 8.

Showing the total numbers of "calls" per day originating from flat rate telephones and from measured rate telephones in "Chicago Exchange" District, excluding ten-party telephones.

Month.	Year.	Calls per Day. Measured Rate.	Calls per Day. Flat Rate.
February,	1893	.....	131,329
August,	1893	.....	117,889
February,	1894	.....	123,817
August,	1894	.....	127,172
February,	1895	.....	168,295
August,	1895	.....	135,964
February,	1896	.....	186,423
August,	1896	.....	177,213
February,	1897	4,554	183,652
August,	1897	5,996	169,963
February,	1898	.....	.....
August,	1898	.....	.....
February,	1899	14,478	270,990
August,	1899	16,179	222,971
February,	1900	39,837	275,263
August,	1900	49,082	254,383
February,	1901	68,037	347,573
August,	1901	69,835	304,576
February,	1902	98,383	376,051
August,	1902	110,109	353,373
February,	1903	152,126	417,113
August,	1903	154,646	342,526
February,	1904	202,506	429,523
August,	1904	190,724	388,575
February,	1905	242,556	.....
August,	1905	220,570	.....
February,	1906	283,475	.....
August,	1906	260,299	.....

DATA FOR CHART NO. 9.

Showing the average number of daily "calls" per line and per telephone on flat rate lines and measured rate lines in "Chicago Exchange" District, excluding ten-party telephones.

Month.	Year.	Average Daily Calls per Measured Rate Line.	Average Daily Calls per Flat Rate Line.	Average Daily Calls per Measured Rate Telephone.	Average Daily Calls per Flat Rate Telephone.
February,	1893	.....	15.15	.....	15.1
August,	1893	.....	12.09	.....	12.1
February,	1894	.....	13.10	.....	13.1
August,	1894	.....	13.05	.....	13.0
February,	1895	.....	16.90	.....	16.8
August,	1895	.....	13.00	.....	13.0
February,	1896	.....	17.30	.....	17.3
August,	1896	.....	15.70	.....	15.7
February,	1897	8.75	16.75	8.75	16.7
August,	1897	9.16	15.44	9.16	15.4
February,	1898	.....	.....	.....	....
August,	1898	.....	.....	.....	....
February,	1899	13.85	23.1	13.80	17.8
August,	1899	11.10	18.05	11.10	13.5
February,	1900	8.70	26.3	8.15	17.9
August,	1900	7.35	25.6	6.53	16.2
February,	1901	9.18	34.9	7.42	20.6
August,	1901	8.71	28.0	6.73	17.5
February,	1902	9.40	35.0	7.10	20.3
August,	1902	9.35	32.1	6.73	17.8
February,	1903	11.50	36.5	7.60	19.5
August,	1903	10.10	28.9	6.03	15.1
February,	1904	12.10	35.1	6.82	17.8
August,	1904	10.90	31.5	5.80	15.1
February,	1905	13.40	40.0	.....	....
August,	1905	11.20	34.6	.....	....
February,	1906	13.30	41.4	.....	....
August,	1906	11.80	38.0	.....	....

Chart No. 9.
Showing the average numbers of daily calls per line and per telephone on flat rate lines and measured rate lines in "Chicago exchange" district excluding 10-party telephones.
Average number of daily calls
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42
1893 Feb.
Aug.
1894 Feb.
Aug.
1895 Feb.
Aug.
1896 Feb.
Aug.
1897 Feb.
Aug.
1898 Feb.
Aug.
1899 Feb.
Aug.
1900 Feb.
Aug.
1901 Feb.
Aug.
1902 Feb.
Aug.
1903 Feb.
Aug.
1904 Feb.
Aug.
1905 Feb.
Aug.
1906 Feb.
Aug.
Average daily calls per flat rate line
Average daily calls per flat rate telephone
Average daily calls per measured rate line
Average daily calls per measured rate telephone

DATA FOR CHART NO. 10.

Showing the number of ten-party telephones, the total number of "calls" per day originating from ten-party telephones, and the average number of "calls" made daily per telephone.

Month.	Year.	Total Number of Calls per Day.	Number of Telephones.	Average Number of Daily Calls per Telephone.
February,	1902	36,599	8,912	4.11
August,	1902	51,725	13,989	3.70
February,	1903	85,399	19,128	4.46
August,	1903	65,193	20,167	3.24
February,	1904	82,981	22,299	3.71
August,	1904	73,947	23,568	3.13
February,	1905	91,753	25,107	3.65
August,	1905	79,364	27,959	2.84
February,	1906	105,521	32,216	3.28
August,	1906	106,847	38,461	2.77

DATA FOR CHART NO. 11.

Record of observations made for the purpose of learning the relation between the number of times a line is used in an hour and the number of times the line is reported busy during the same hour.

Messages in an Hour, Out and In.	Number of Observations.	Number of Times Line Reported Busy.	Average Number of Times Line Reported Busy.
1	...	...	.....
2	256	48	.19
3	251	75	.30
4	258	80	.31
5	276	209	.76
6	246	197	.80
7	251	341	1.36
8	184	246	1.34
9	148	236	1.59
10	114	259	2.27
11	114	356	3.12
12	89	197	2.21
13	59	188	3.19
14	58	220	3.80
15	54	156	2.87
16	41	170	4.15
17	28	193	6.90
18	28	161	5.75
19	25	77	3.08
20	13	131	10.08
21	16	164	10.25
22	11	113	10.28

DATA FOR CHART NO. 12.

Showing the change in the average price paid each year per telephone in Chicago for the last ten years, excluding "neighborhood" telephones.

Year.	Average Number of Telephones in Use During the Year.	Average Rate Paid per Telephone During the Year.
1897	13,163	$123.53
1898	15,020	120.47
1899	18,377	112.80
1900	23,586	100.81
1901	33,831	87.22
1902	50,642	70.33
1903	68,271	63.99
1904	81,445	61.14
1905	95,566	57.79
1906	113,782	53.29

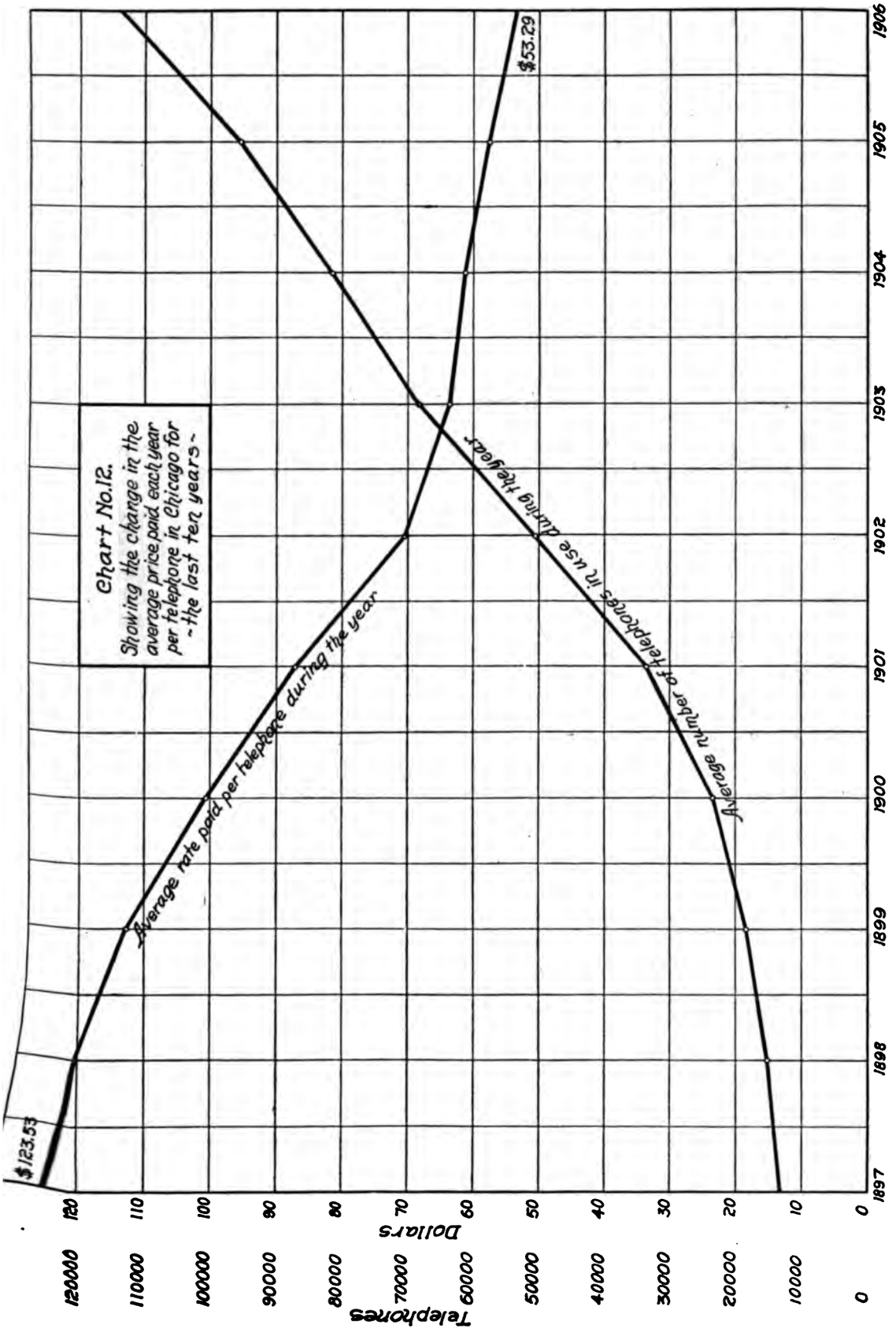


Chart No.12.
Showing the change in the average price paid each year per telephone in Chicago for the last ten years.
$123.53
$53.29
Average rate paid per telephone during the year
Average number of telephones in use during the years
Telephones
Dollars
1897
1898
1899
1900
1901
1902
1903
1904
1905
1906

DATA FOR CHART NO. 13.

Showing the change in the average price paid each year per telephone in the "Neighborhood Exchange" Districts for the last ten years.

Year.	Average Number of Telephones in Use During the Year.	Average Rate paid per Telephone During the Year.
1897	352	$60.85
1898	393	59.25
1899	655	48.29
1900	977	39.04
1901	1,325	32.77
1902	2,042	28.15
1903	3,170	29.43
1904	4,366	27.72
1905	5,674	26.42
1906	7,404	25.24

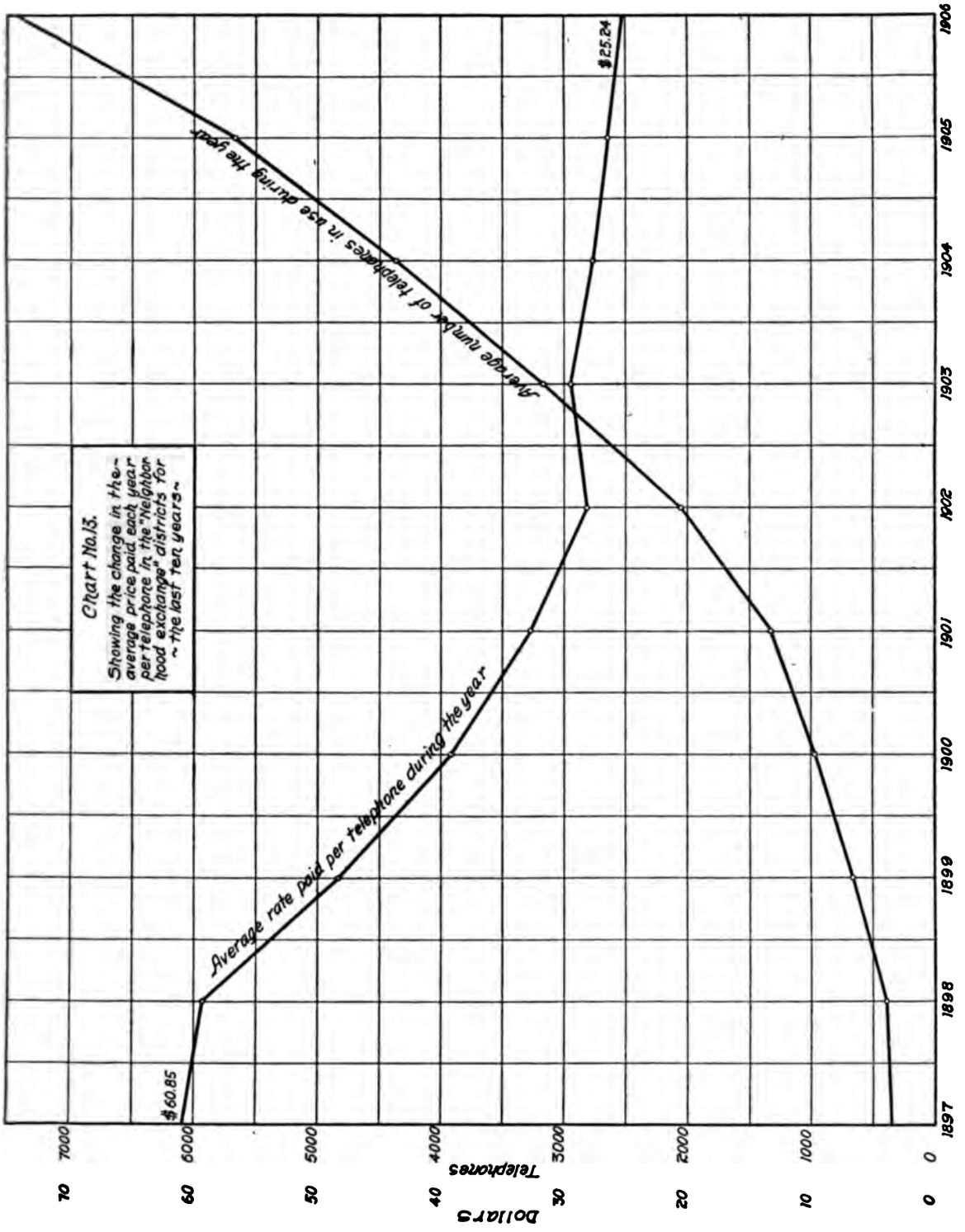


Chart No. 13.
Showing the change in the average price paid each year per telephone in the "Neighborhood exchange" districts for the last ten years.
Average number of telephones in use during the year
Average rate paid per telephone during the year
$60.85
$25.24
1897
1898
1899
1900
1901
1902
1903
1904
1905
1906
0
1000
2000
3000
4000
5000
6000
7000
Telephones
0
10
20
30
40
50
60
70
Dollars

DATA FOR CHART NO. 14.

Showing the number of telephones in use in Chicago for each one hundred inhabitants.

Year.	Population.	Average Number of Telephones.	Number of Telephones per One Hundred Inhabitants.
1894	1,567,727	9,594	.61
1896	1,616,635	11,034	.69
1898	1,851,588	15,020	.81
1900	1,698,575	23,586	1.39
1901	1,773,939	33,831	1.91
1902	1,863,833	50,642	2.80
1903	1,970,450	68,271	3.65
1904	2,075,528	81,445	3.92
1905	2,206,009	95,566	4.33
1906	2,341,420	113,782	4.86

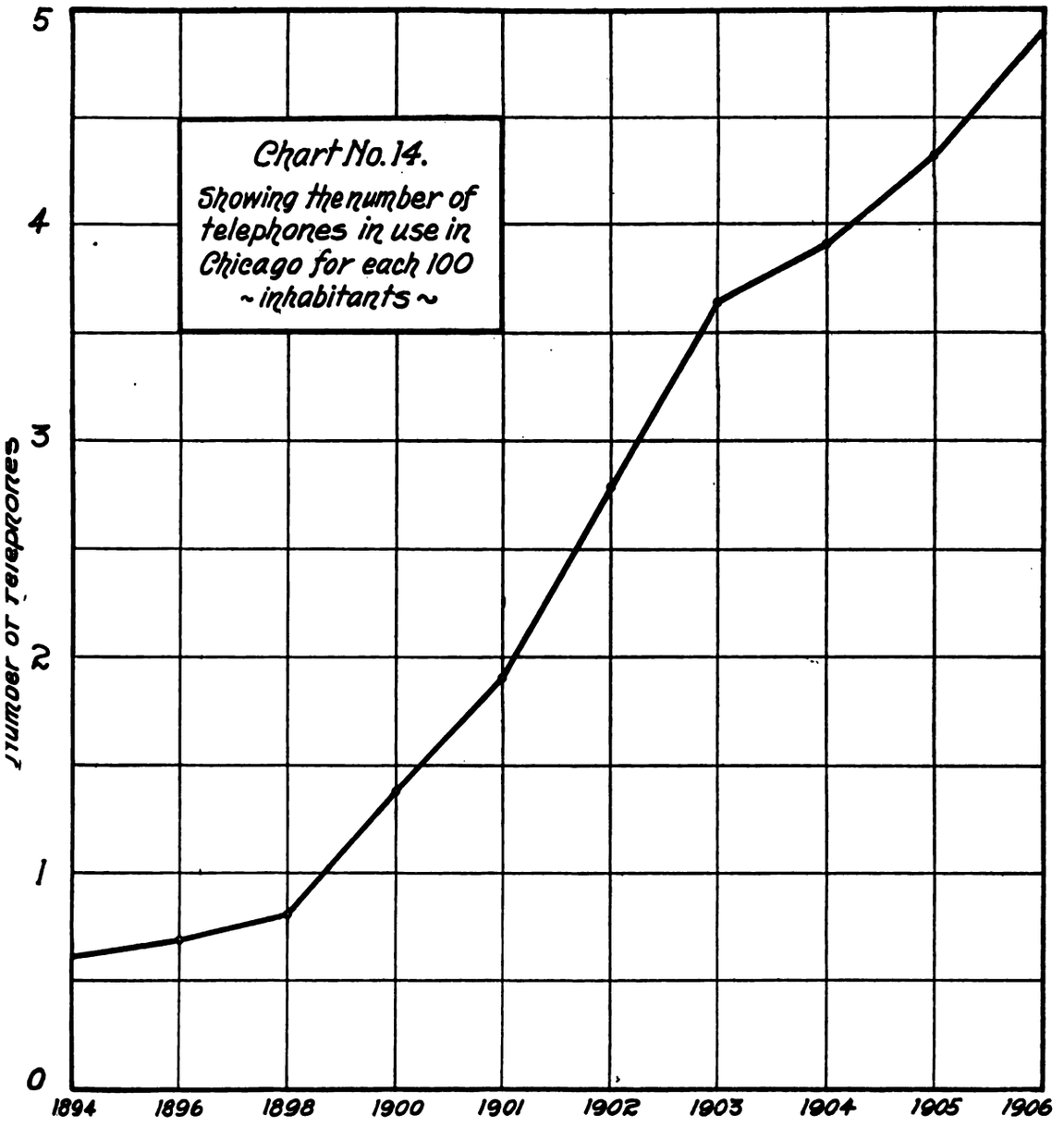


Chart No. 14.
Showing the number of telephones in use in Chicago for each 100 ~ inhabitants ~
Number of Telephones
0
1
2
3
4
5
1894
1896
1898
1900
1901
1902
1903
1904
1905
1906

DATA FOR CHART NO. 15.

Showing the way in which trunked calls ("B" Calls) increase as the service extends.

	Total Originating Calls.	Total Flat Rate Calls.	Total "B" Calls.	Total Measured Rate Calls.
February, 1900.....	315,100	275,263	.....	39,837
August, 1900.....	303,465	254,383	220,913	49,082
February, 1901.....	419,433	347,573	280,666	71,860
August, 1901.....	.....	.....	.....	.....
February, 1902.....	511,033	376,051	358,544	134,982
August, 1902.....	515,207	353,373	352,311	161,834
February, 1903.....	654,638	417,113	417,240	237,525
August, 1903.....	562,365	342,526	367,201	218,839
February, 1904.....	715,020	429,533	442,579	285,487
August, 1904.....	653,246	388,575	408,614	264,671
February, 1905.....	740,053	505,744	493,108	334,309
August, 1905.....	759,739	456,805	452,778	299,934
February, 1906.....	952,159	563,163	552,751	388,996
August, 1906.....	916,622	549,476	528,986	367,146

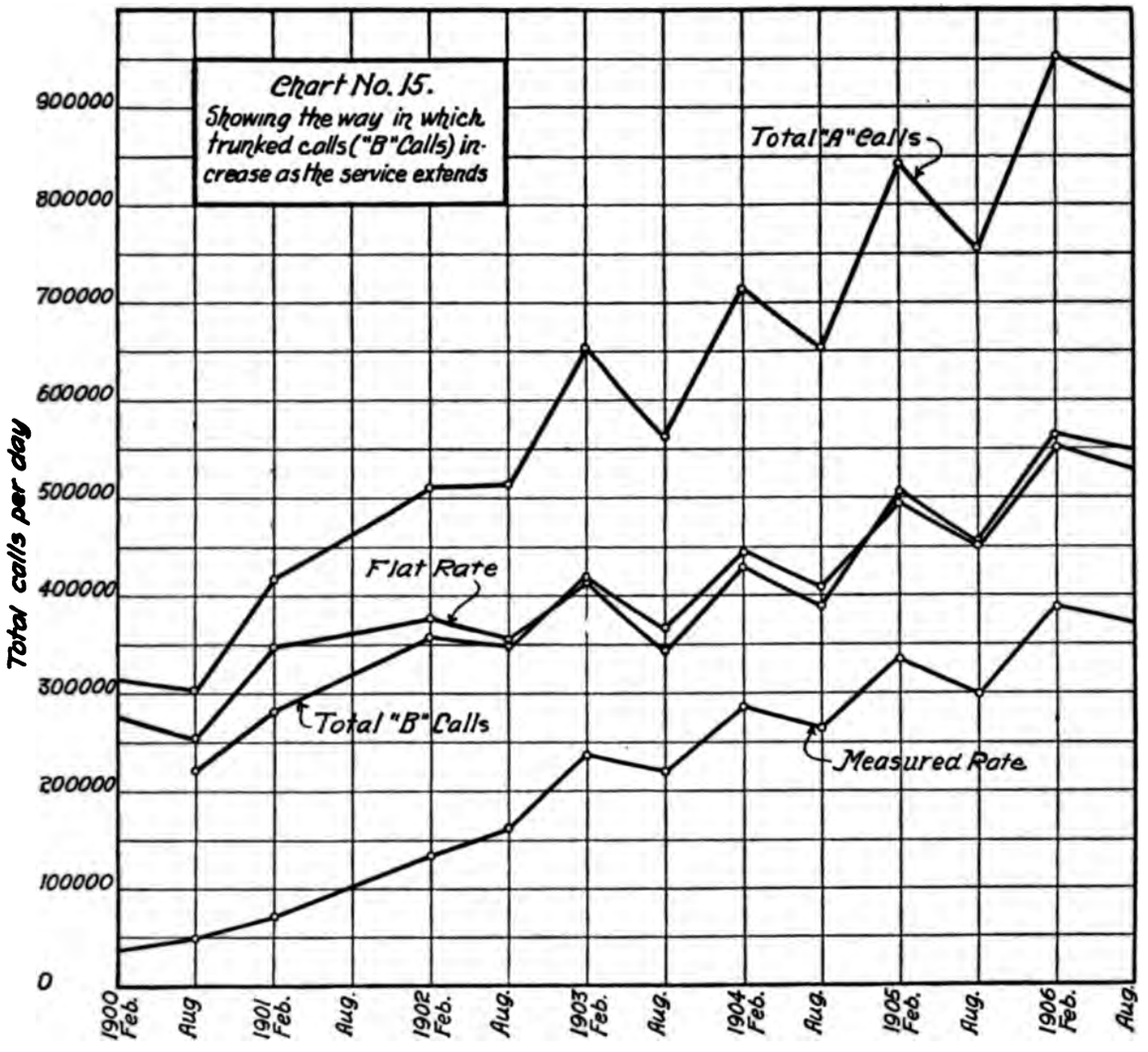
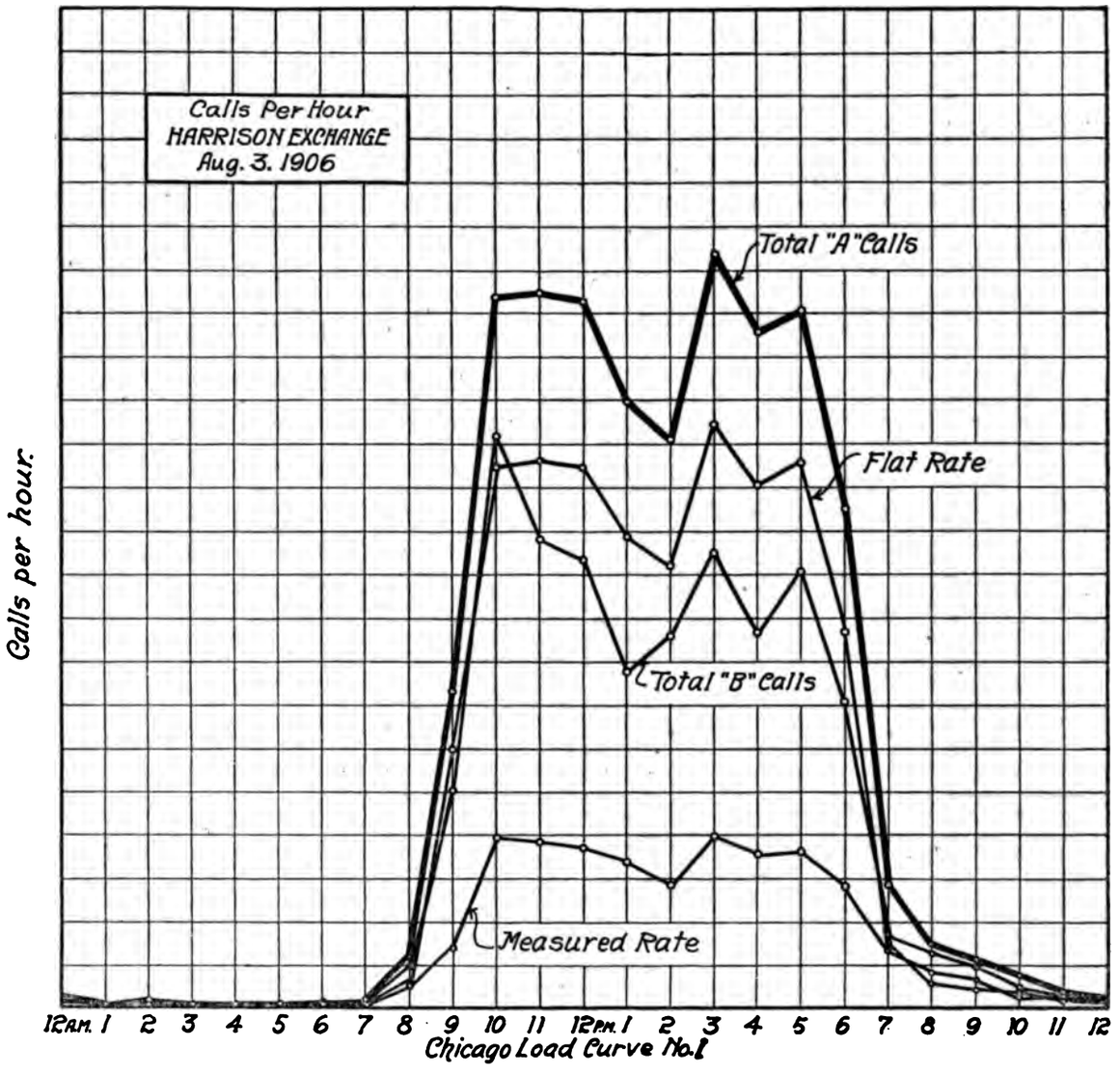
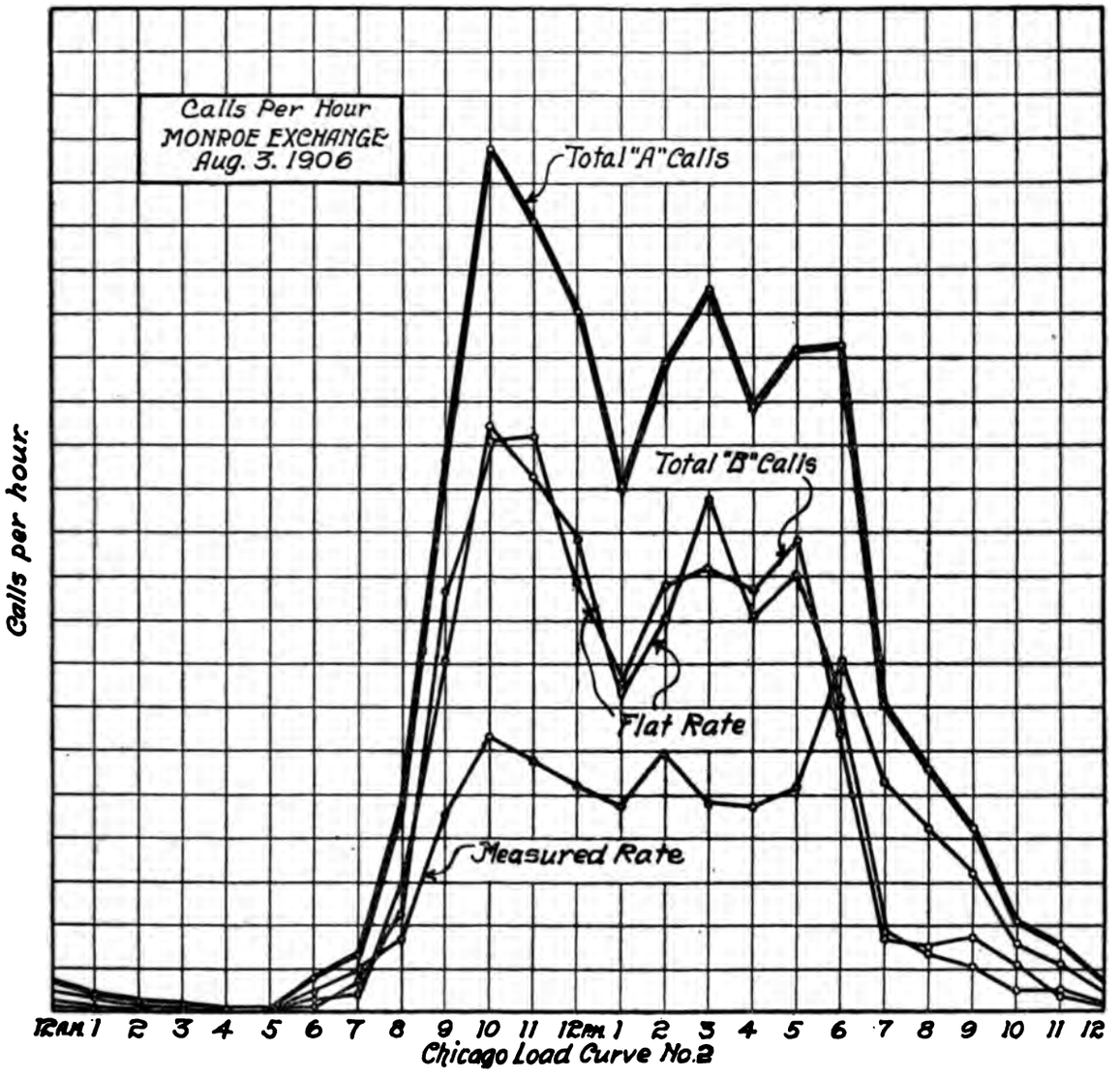
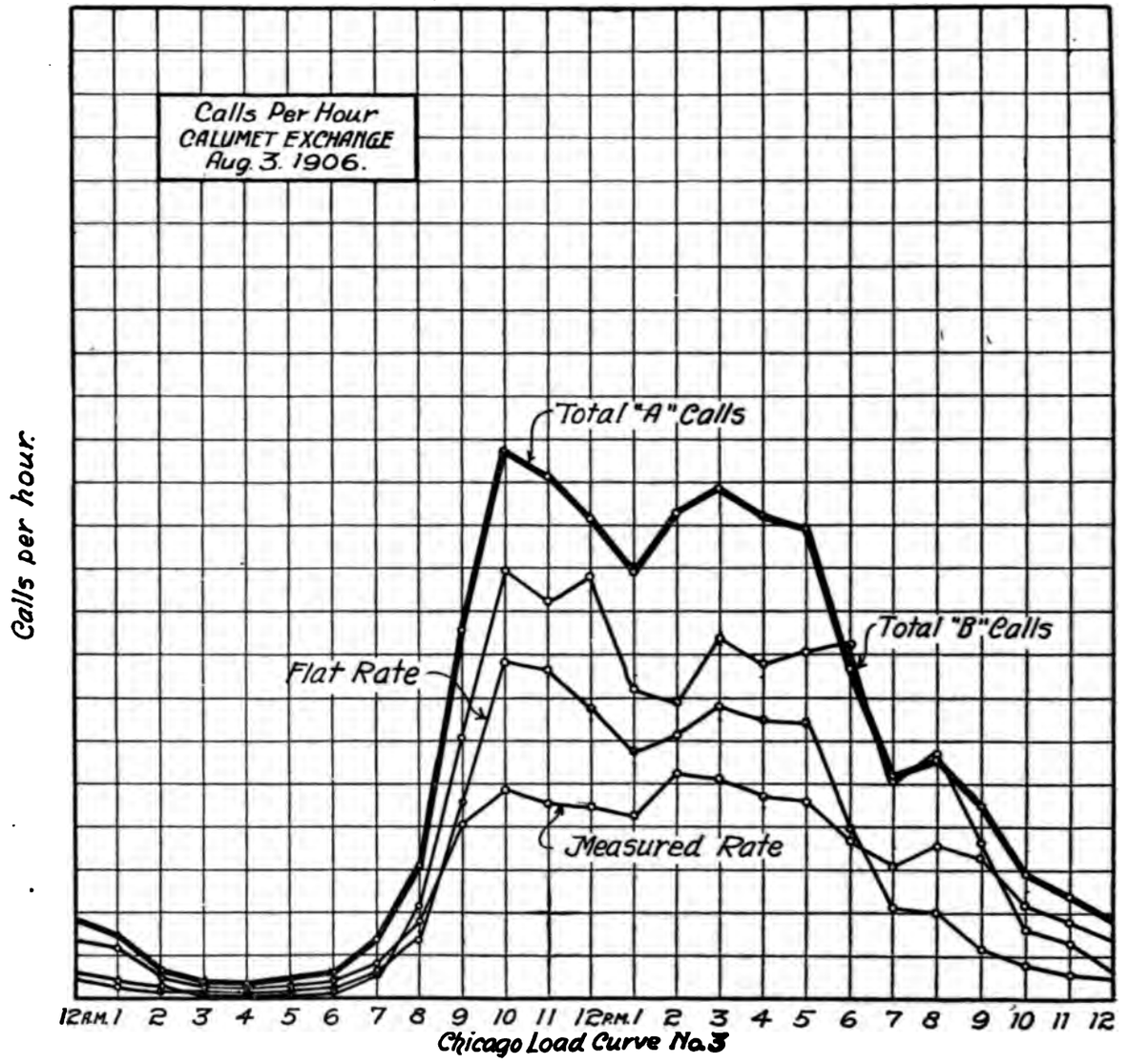


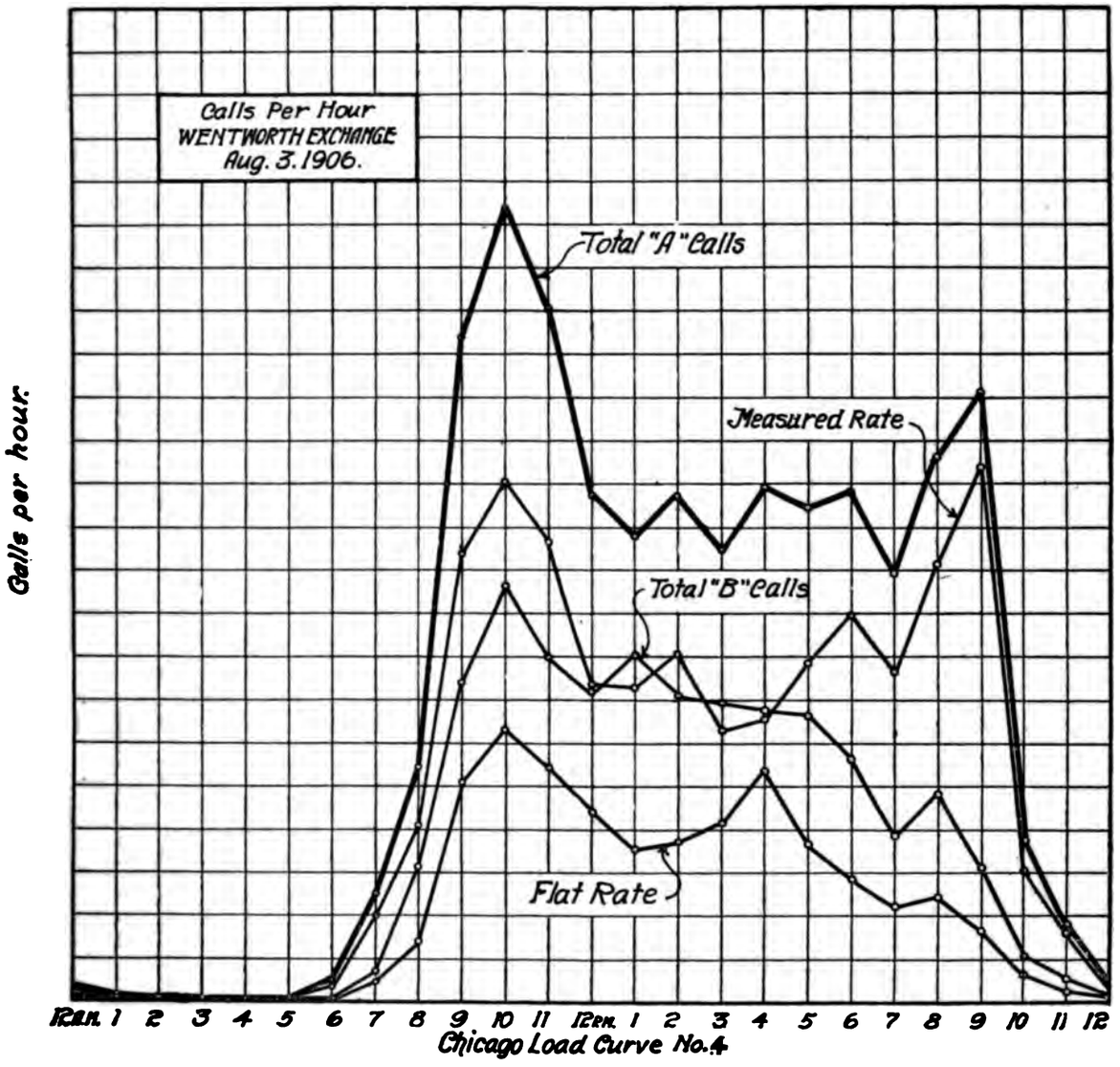
Chart No. 15.
Showing the way in which trunked calls ("B" Calls) increase as the service extends
Total "A" Calls
Flat Rate
Total "B" Calls
Measured Rate
Total calls per day
900000
800000
700000
600000
500000
400000
300000
200000
100000
0
1900 Feb.
Aug.
1901 Feb.
Aug.
1902 Feb.
Aug.
1903 Feb.
Aug.
1904 Feb.
Aug.
1905 Feb.
Aug.
1906 Feb.
Aug.


Calls Per Hour
HARRISON EXCHANGE
Aug. 3. 1906
Total "A" Calls
Flat Rate
Total "B" Calls
Measured Rate
Calls per hour.
12 A.M. 1 2 3 4 5 6 7 8 9 10 11 12 P.M. 1 2 3 4 5 6 7 8 9 10 11 12
Chicago Load Curve No. 1

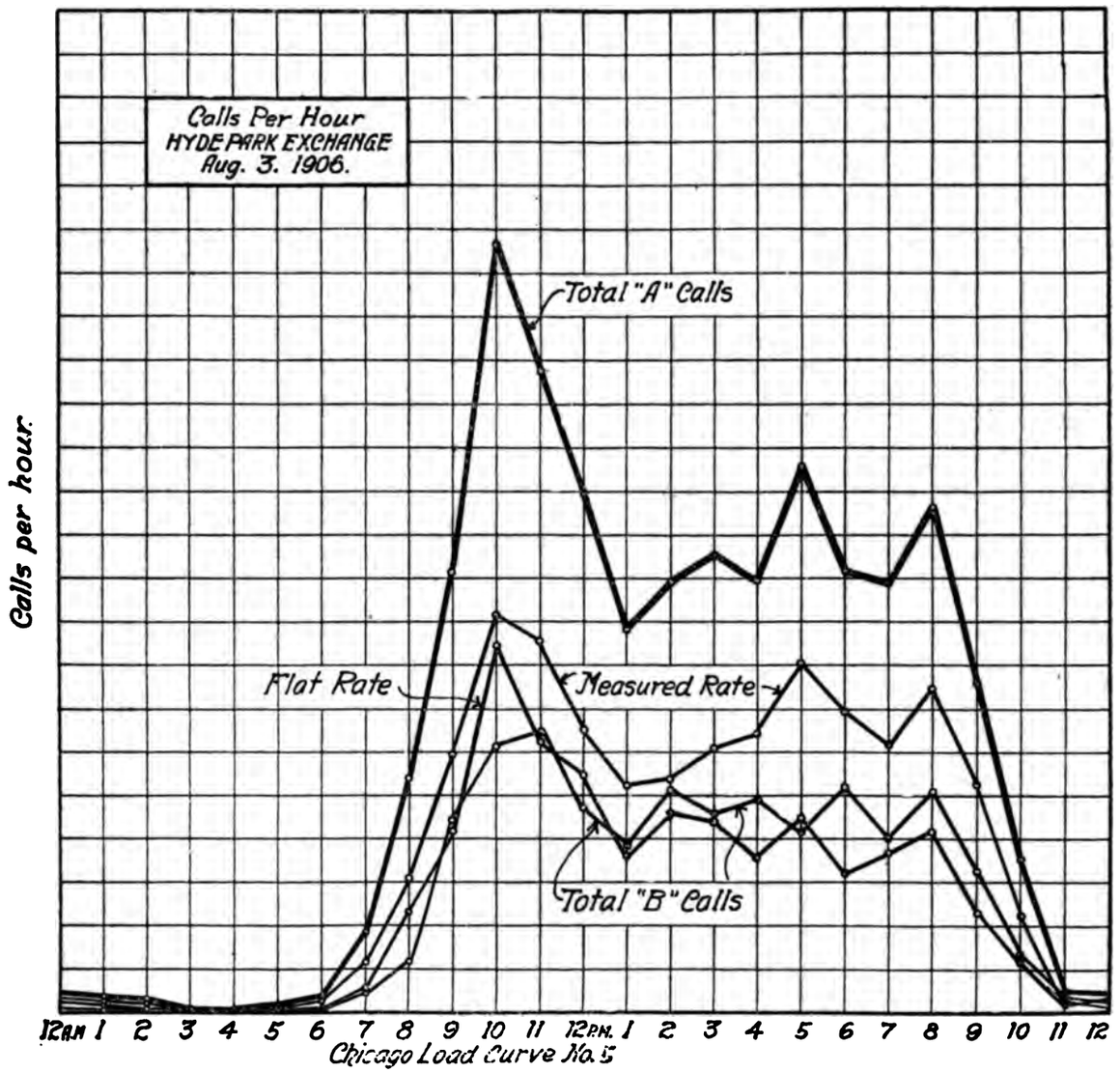

Calls Per Hour
MONROE EXCHANGE
Aug. 3. 1906
Total "A" Calls
Total "B" Calls
Flat Rate
Measured Rate
Calls per hour.
12Am 1 2 3 4 5 6 7 8 9 10 11 12Pm 1 2 3 4 5 6 7 8 9 10 11 12
Chicago Load Curve No.2


Calls Per Hour
CALUMET EXCHANGE
Aug. 3. 1906.
Total "A" Calls
Total "B" Calls
Flat Rate
Measured Rate
Calls per hour.
12 P.M. 1 2 3 4 5 6 7 8 9 10 11 12 P.M. 1 2 3 4 5 6 7 8 9 10 11 12

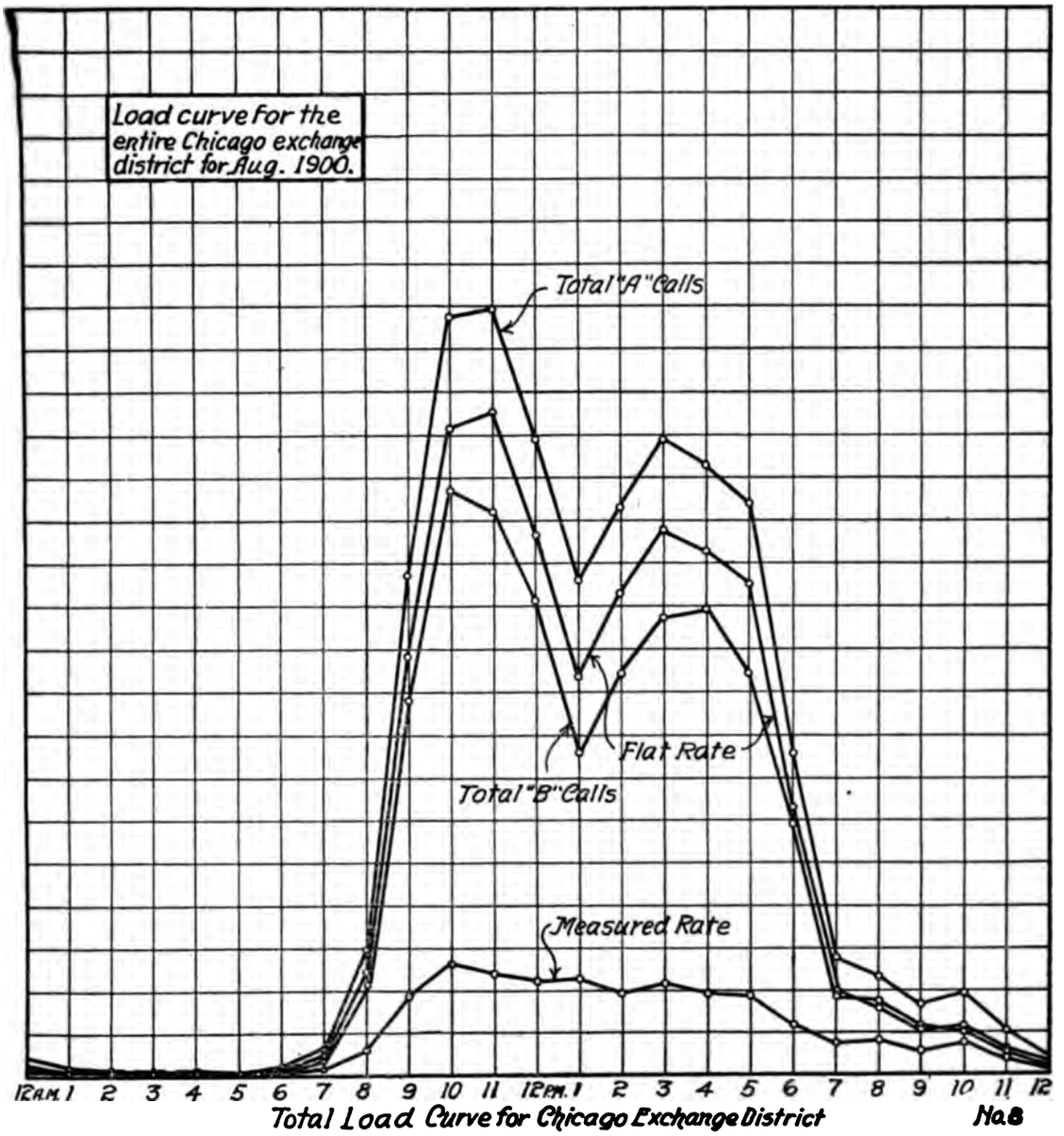
Chicago Load Curve No. 3


Calls Per Hour
WENTWORTH EXCHANGE
Aug. 3. 1906.
Total "A" Calls
Measured Rate
Total "B" Calls
Flat Rate
Calls per hour.
Midn. 1 2 3 4 5 6 7 8 9 10 11 Noon 1 2 3 4 5 6 7 8 9 10 11 12

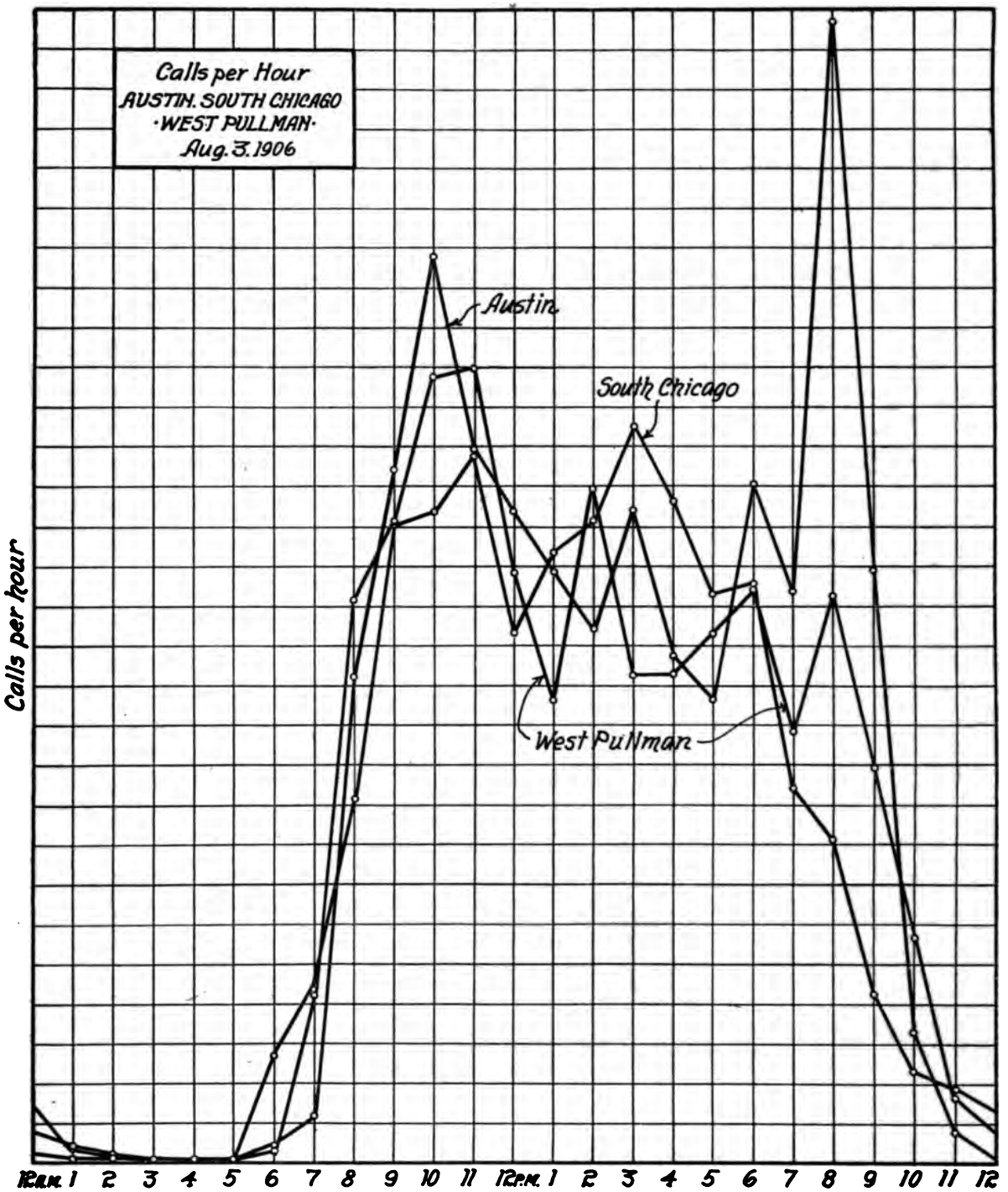
Chicago Load Curve No. 4


Calls Per Hour
HYDE PARK EXCHANGE
Aug. 3. 1906.
Total "A" Calls
Flat Rate
Measured Rate
Total "B" Calls
Calls per hour.
12AM 1 2 3 4 5 6 7 8 9 10 11 12PM. 1 2 3 4 5 6 7 8 9 10 11 12

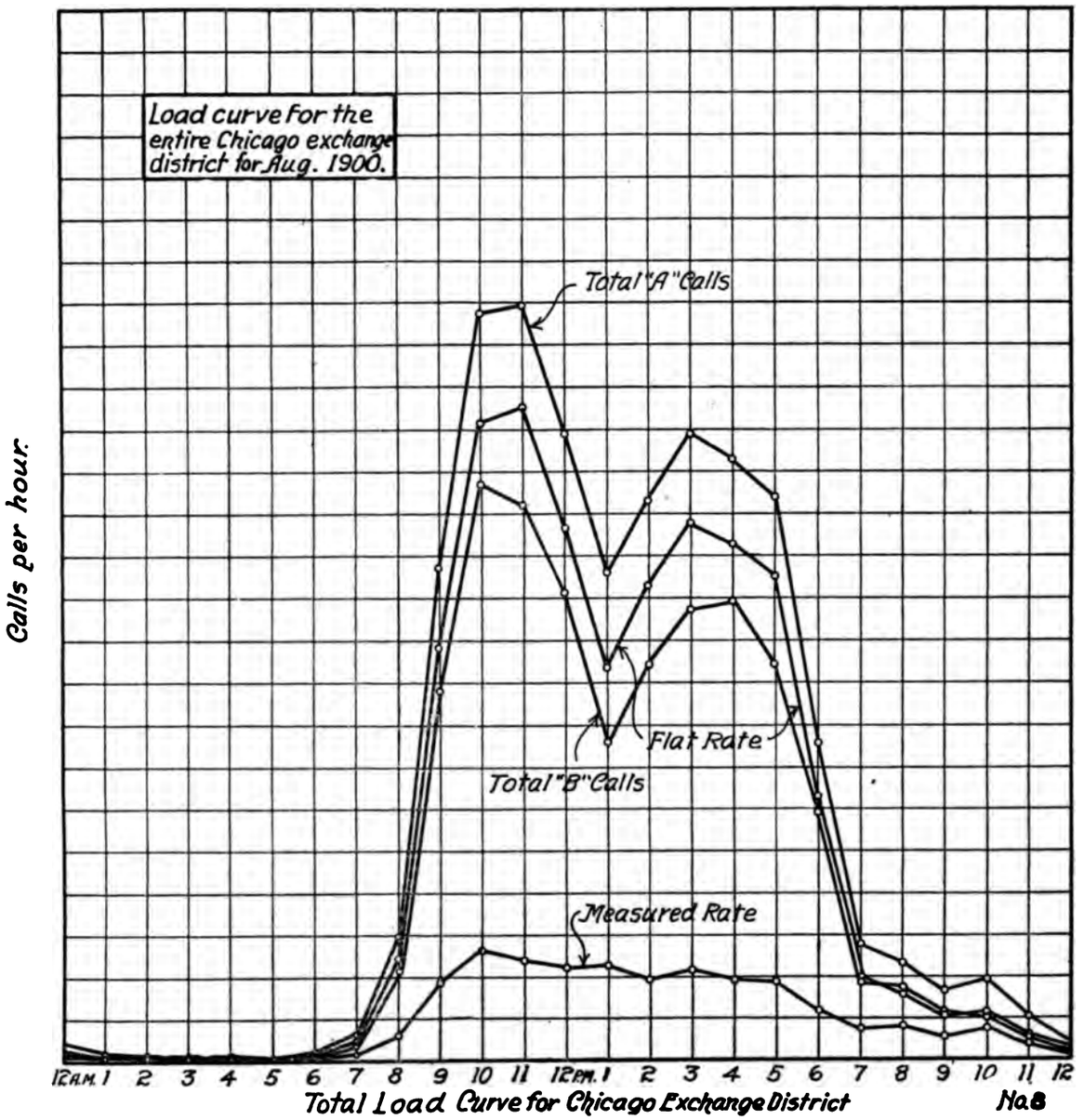
Chicago Load Curve No. 5


Load curve for the entire Chicago exchange district for Aug. 1900.
Total "A" Calls
Flat Rate
Total "B" Calls
Measured Rate
12 A.M. 1 2 3 4 5 6 7 8 9 10 11 12 P.M. 1 2 3 4 5 6 7 8 9 10 11 12

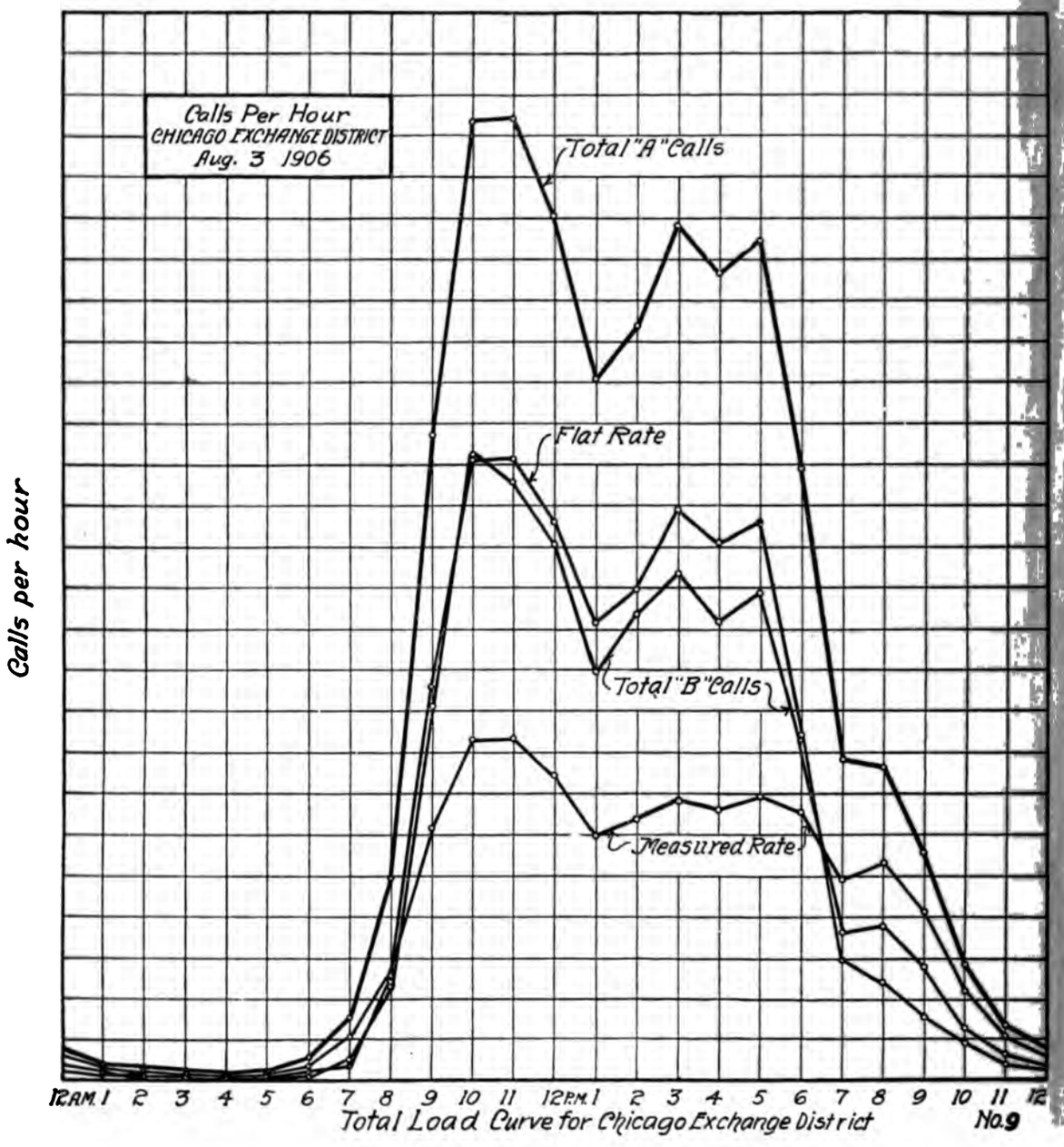
Total Load Curve for Chicago Exchange District No. 8


Calls per Hour
AUSTIN. SOUTH CHICAGO
·WEST PULLMAN·
Aug. 3. 1906
Austin
South Chicago
West Pullman
Calls per hour
12 A.M. 1 2 3 4 5 6 7 8 9 10 11 12 P.M. 1 2 3 4 5 6 7 8 9 10 11 12

Load curve for three principal neighborhood exchanges. No. 7


Load curve for the entire Chicago exchange district for Aug. 1900.
Total "A" Calls
Flat Rate
Total "B" Calls
Measured Rate
Calls per hour.
12 A.M. 1 2 3 4 5 6 7 8 9 10 11 12 P.M. 1 2 3 4 5 6 7 8 9 10 11 12

Total Load Curve for Chicago Exchange District No. 8


Calls Per Hour
CHICAGO EXCHANGE DISTRICT
Aug. 3 1906
Total "A" Calls
Flat Rate
Total "B" Calls
Measured Rate
Calls per hour
12 AM 1 2 3 4 5 6 7 8 9 10 11 12 PM 1 2 3 4 5 6 7 8 9 10 11 12

Total Load Curve for Chicago Exchange District No. 9